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DECEMBER, 1955

# METAL FINISHING

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

FOUNDED 1903

THE LIBRARY OF  
CONGRESS  
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**Quality Tests for Black Oxide Coatings on Steel**  
*Oxalic Acid Drop Test as Substitute for Salt Spray*

**Filters — Construction and Operation**  
*How to Choose and Use a Filter*

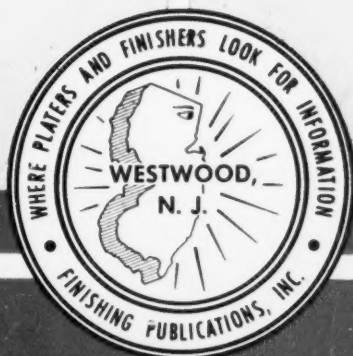
**The Cr-22 Coating for Magnesium**  
*Details of Newest Anodic Protective Treatments*

**The Structure of Electrodeposited Metals**  
*Study of Surfaces with Electron Microscope*

**Finishing Pointers**  
*Plating Within Limits*

**Science for Electroplaters**  
*Solutions — Equations*

**Complete Contents Page 45**



READ & PASS ON



## HOLIDAY GREETINGS AND THANKS TO OUR MANY FRIENDS

With our sincere wish for a  
Happy Holiday Season goes  
hearty thanks for making 1955  
a boom year for CLEPO.

We pledge to merit the confidence  
you have placed in us by serving  
you during the coming year with  
an even bigger and better line of

**CLEPO PRODUCTS**



FREDERICK

**GUMM**

*Chemical Company Inc.*

538 FOREST STREET, KEARNY, N. J.



**ENTHONE***Leads* in SPECIALTY  
FINISHING PRODUCTS**METAL STRIPPERS****"ALUMON"**  
for Plating on Aluminum**RUST REMOVERS****RUST PROOFING  
COMPOUNDS****ENAMEL STRIPPERS****METAL BLACKENING  
COMPOUNDS****Metal Cleaning and  
Degreasing Compounds****Conversion Coatings  
for Zinc and Cadmium****STOCK POINTS:**Seattle, San Francisco,  
Los Angeles, Chicago,  
Detroit, Dayton,  
Cleveland,  
Binghamton, New Haven**WORLD-WIDE  
DISTRIBUTION**... ALSO IN  
Canada, Brazil,  
England, France,  
Sweden and Germany

Since 1930, ENTHONE Incorporated has developed and brought to the metal finishing market many specialty products and processes. Often these products have provided the answers to finishing problems previously unsolved. ENTHONE ENSTRIPS, for example, are patented products for the selective dissolving of one metal plated on another without attacking the base metal.

**ENSTRIP A**—U.S. Patent No. 2,649,361—was the first product ever offered for dissolving nickel plate without attack on the steel basis metal.

**ENSTRIP 165-S**—U.S. Patent No. 2,698,781—was the first product ever offered for dissolving nickel from copper base alloys without attack on the basis metal. And there are many other selective strippers in the ENSTRIPS group to meet all requirements.

If you have a metal finishing problem, ask ENTHONE *first!* Write now for the folder "They are HERE..." describing 20 ENTHONE answers to difficult finishing problems.

**ENTHONE**  
INCORPORATED442 ELM STREET, NEW HAVEN 11, CONNECTICUT  
*Metal Finishing Processes • Electroplating Chemicals*

## HAVE YOU HEARD ABOUT THIS EXTRAORDINARY CLEANER?

### ***It saves money in paint shops!***

Oakite Rustripper is an alkaline material that strips paint, pigment residues and phosphate coatings from steel at the same time that it removes rust and oil.

### ***It saves money in plating shops!***

Oakite Rustripper removes rust or heat scale from steel at the same time that it removes oil and other soils. It avoids hydrogen embrittlement, damage to machined surfaces and other disadvantages of acid pickling.

### **FREE**

For more information about how Oakite Rustripper eliminates operations in paint shops and plating shops, send for one or both of the illustrated booklets listed in the coupon.

Technical Service Representatives in  
Principal Cities of U. S. and Canada

Export Division Cable Address: Oakite



**OAKITE PRODUCTS, INC.**  
18 Rector Street, New York 6, N. Y.

Send me free booklet checked below:

- ☐ "Here's the best shortcut in the field of organic finishing"  
☐ "Here's the best shortcut in the field of electroplating"

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

### **Paint Shop Men Save Time With New Kind of Stripper**

**INDIANA:** "We formerly stripped TV cabinet rejects in 25 minutes. They came out a brown tarnished color... Had to pickle to remove phosphate coating... Today Oakite Rustripper strips the same cabinet in less than 10 minutes, bringing it out so bright and clean you can't tell it from a new one... Pickle, neutralize and rinses eliminated."

**NEW YORK:** "It used to take two hours to strip synthetic enamel from these rejects (filing cabinets). Now Rustripper does them in about two minutes. We used to soak conveyor chain links overnight and work hooks for several days. Rustripper does both jobs in two hours and cuts out the wire brushing for rust."

**COLORADO:** "We were amazed at the results... a perfect job of stripping gray OD enamel, red oxide prime and surface rust from bomb clusters. Oakite Rustripper is the finest material ever used here."

Send for free booklet "*Here's the best shortcut in the field of organic finishing.*" See coupon at left.

### **Electroplaters Find Profit in Alkaline Derusting**

**CALIFORNIA:** "Formerly sand blasted the heat scale off these aircraft parts. Now the scale is removed in about 30 minutes with a boiling soak in Rustripper at 4 pounds per gallon, rinse, reverse-current clean, rinse; followed by cyanide dip and cadmium plate."

**NEW YORK:** Removing heavy heat-treat scale, rust and soil from steel aircraft parts before cadmium plating. Also cleaning stainless steel landing gear parts after hardening. Using 3 pounds Oakite Rustripper and 10 ounces sodium cyanide per gallon at 120°F. with periodic reverse current. "An excellent job is being done... Parts are being descaled that we couldn't touch without pickling in muriatic acid... Everyone astounded at life of solution, since this bath is worked very hard and former bath required heavy upkeep... Appears likely to save about \$2000 in first year."

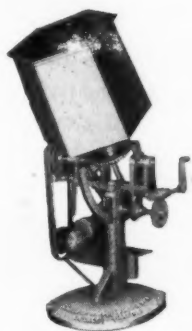
**CALIFORNIA:** "Oakite Rustripper seems to be what hard chrome platers have been waiting for." Used for removing rust from steel shafts after chrome plating, baking, machining, etc., and before oiling. Rust was formally rubbed away with emery paper.

Send for free booklet "*Here's the best shortcut in the field of electroplating.*" See coupon at left.

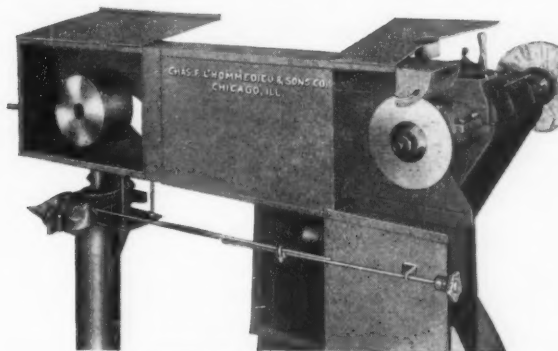
# USE "RELIANCE" PRODUCTS FOR

**ECONOMY : EFFICIENCY : DEPENDABILITY**

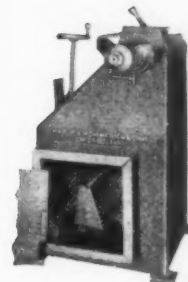
**WRITE FOR FURTHER DETAILS**



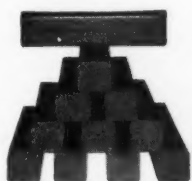
**OBLIQUE  
TUMBLING BARREL**



**BACKSTAND IDLER WITH LATHE**



**#23A  
POLISHING LATHE**



**EXTRUDED COMPOSITIONS  
STANDARD SIZE  
2 x 2 x 10"**



**BACKSTAND IDLER**



**NUWAY BUFFS FOR  
FAST CUTTING**

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Complete Plating Plants Installed**



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**CHICAGO**



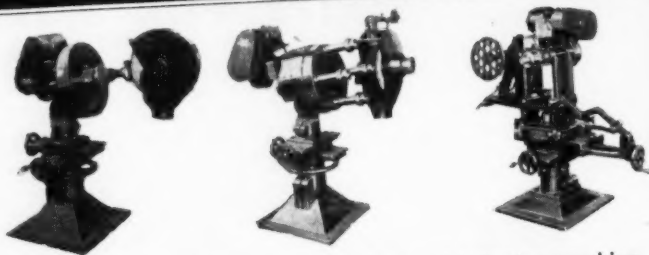
Branches:  
Cleveland  
and  
Los Angeles



# ACME *Automatics* PUT POLISHING and BUFFING OPERATIONS on a low cost production basis . . .

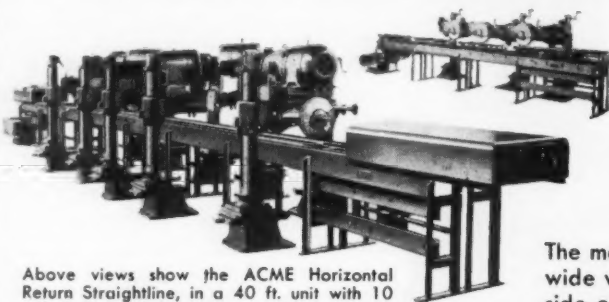
## ACME *Semi-Automatics*

ACME Semi-Automatics are built to "deliver the goods." They can be fully relied upon to cut finishing costs, maintain production levels and stand up under long hours of operation!



The three ACME Semi-Automatics above are from left to right, the ACME A-2, a 2 spindle hand indexing machine for polishing and buffing cylindrical parts up to 12" diameter . . . the ACME L-4, a 4 spindle automatic indexing machine with a normal range of 250 to 400 indexes per hour . . . and the ACME D-10, an oscillating machine for finishing out of round parts. These machines are proved producers.

WRITE FOR CATALOG ILLUSTRATING WIDE RANGE OF TYPES



Above views show the ACME Horizontal Return Straightline, in a 40 ft. unit with 10 ACME Type G-1 adjustable floating head polishing and buffing lathes . . . and a 20 ft. unit with 3 ACME Type G-3 lathes.

## ACME *Straight Lines*

ACME Straightlines provide effective solutions to many finishing problems. ACME progressive experience and engineering assure dependable performance at high production levels.

The machine illustrated is unusually versatile and adaptable to a wide variety of work. It may be loaded or unloaded from either side or either end. Polishing and buffing heads may be used on either or both sides and may vary in number to suit the required production and finish.

WRITE FOR OUR STRAIGHTLINE CATALOG ILLUSTRATING OTHER TYPES

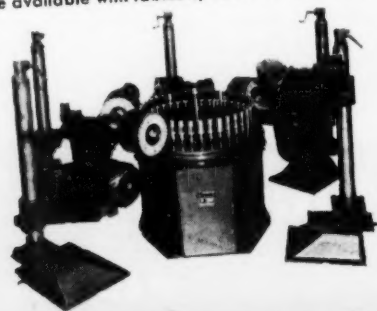
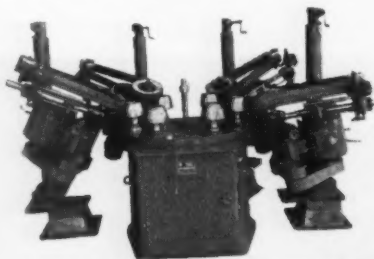
## ACME *Rotary Automatics* . . .

ACME 40" Rotary with 6 station indexing table and 4 ACME Type G-1 lathes with belt arm attachment. One second indexing time . . . up to 1800 indexes per hour. Acme Indexing Rotaries are available in table sizes from 18 in. to 10 ft. diameter.

ACME 10 ft. Combination Rotary . . . for continuous operation using 24 continuously revolving spindles or for 12 station indexing operation using every other spindle. One second indexing time . . . up to 1200 indexes per hour.

ACME 50" Continuous Rotary Automatic with 40 spindles equipped with 4 Acme Type G-3 heavy duty 15 H.P. polishing and buffing lathes with inverted spindles. ACME Continuous Rotaries are available with tables up to 24 ft. diameter.

WRITE FOR ROTARY CATALOG



for POLISHING • BUFFING  
GRINDING • MICRO-FINISHING  
DE-BURRING • WIRE BRUSHING



**ACME Manufacturing Co.**  
1400 E. 9 MILE RD., DETROIT 20 (Ferndale) MICH.  
*Builders* OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR NEARLY HALF A CENTURY



# PRODUCTION RECORDS PROVE...

# BLACOSOLV<sup>®</sup>

## DEGREASING SOLVENT

## CAN'T BE BEAT!

In plant after plant, production departments report "greatly improved cleaning" ... "Rejects reduced from normal 15% to less than 1%" ... "not one case of solvent breakdown" ... "cleanout periods extended" ... "Savings up to \$550.00 weekly due to fewer cleanouts and less solvent consumption."



*Write now to learn why you can save money and increase production with Blacosolv Degreasing Solvent and Blakeslee Degreasers.*

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1844 S. Laramie Ave., Chicago 50, Ill.  
NEW YORK • LOS ANGELES • TORONTO

*also Manufacturers of Blakeslee Metal Washing and Surface Treatment Machines*



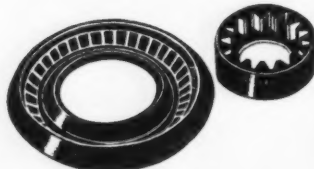
AMAZING TENSILE STRENGTH



PERMANENT FLEXIBILITY



CONTINUOUS ADHESION



RUGGED SCUFF RESISTANCE



POSITIVE INSULATION



DURABLE PROTECTION

When...

**THEY'RE MICCROSOL COATED**

## They Meet the Highest Industrial Standards

**MICCROSOL E-1003** Heat-Cured Rack Coating is a 100% solids, non-evaporating material that produces a smooth, tough, leather-like coating which will often outlast the rack. Exceptional adhesion is achieved through the use of our primers.

In addition to the outstanding characteristics listed above, tests for abrasion and resistance to all commonly used plating solutions, acids, and caustics show superior performance in comparison to similar products. MICCROSOL E-1003 has proven to excel as a coating for materials-handling equipment, baskets, hangers, and a wide variety of plating equipment parts.

MICCROSOL E-1003 has an exceptionally high gloss, allowing free drainage, and no solution carry-over.

*We will be pleased to help you with your coating problems. Send us full particulars.*

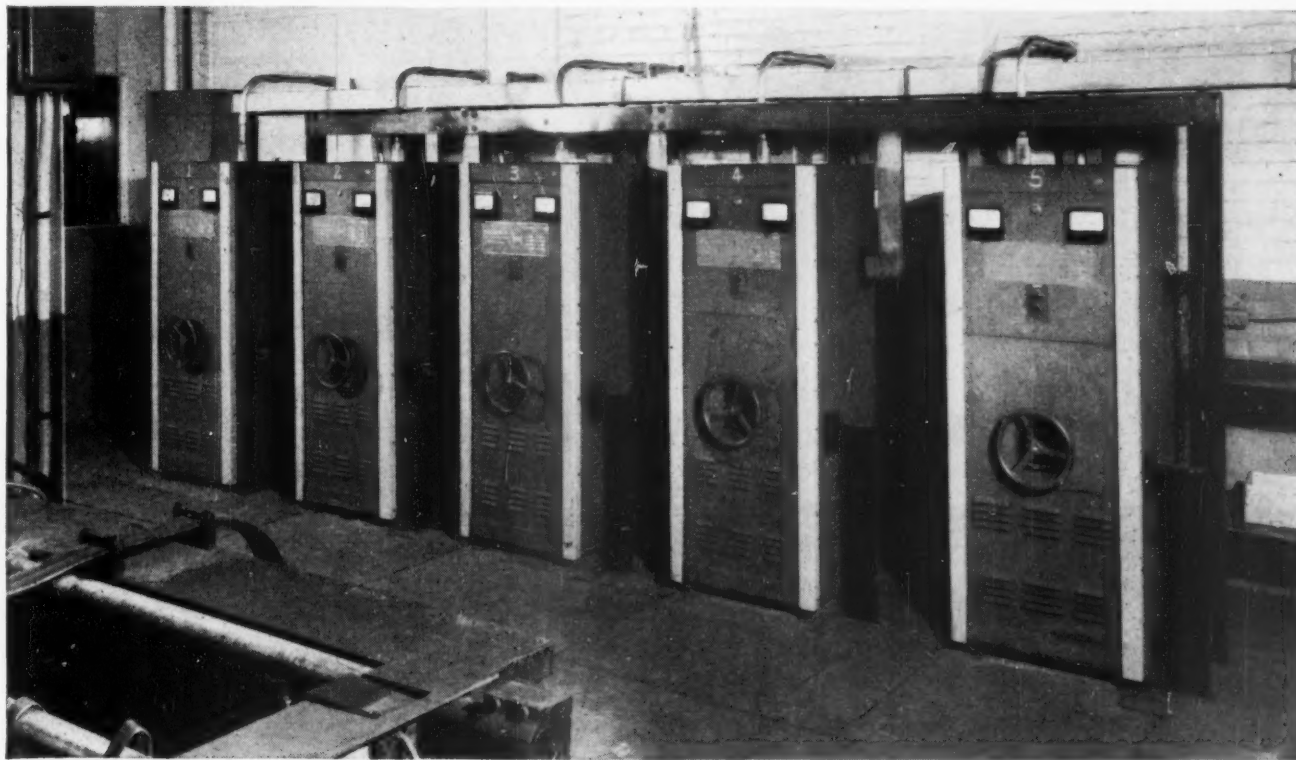


**MICHIGAN CHROME**  
*and Chemical Company*

8613 Grinnell Avenue • Detroit 13, Michigan



# 5 Rapid Selenium Rectifiers form Power-Packed Line-up at Warner & Swasey



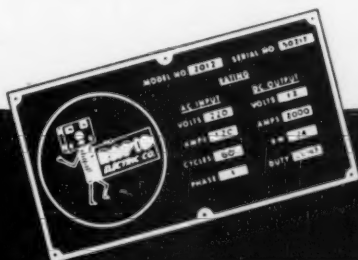
Warner & Swasey's chromium plating installation features a power-packed line-up of five Rapid Selenium Rectifiers. It's Rapid power, then, along with extensive know-how and other excellent equipment that helps Warner & Swasey turn out only quality chromium plating which is in keeping with their reputation for building the finest of precision, metal-turning machine tools.

"Multiple Rapid" installation such as this are not uncommon. Because, once a plater buys a Rapid Rectifier, he almost always buys more as his power needs increase. Additional Rapid Rectifiers are specified because of the complete satisfaction derived from the efficient, dependable, low cost performance of the original unit. It is this feeling of satisfaction on the part of our plating customers that is responsible for Rapid's growth in the industry.

Plating men know that when they specify Rapid for their DC Power needs, they are getting first of all, an engineered DC power supply which gives them six square inches per ampere of plate surface and many other "plus" features, such as:

- Long-time service
- High efficiency
- No lost time due to burnouts
- No loss of efficiency due to overheating
- No supervision needed
- No maintenance needed
- Maximum Safety Features

Our engineering department is available for consultation on any application of Direct Current Power Supplies. Avail yourself of this professional service without obligation.



THE NAMEPLATE THAT MEANS *"More Power to You!"*

## RAPID ELECTRIC COMPANY

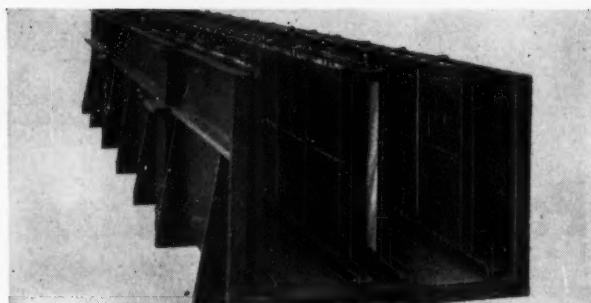
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● A remarkable advancement in electroplating, Diaphragm Systems, engineered and installed by ARco have created a new high standard in plating production and quality.

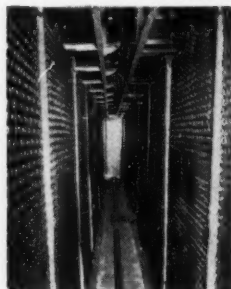
Simply, economically installed, Diaphragm Systems efficiently segregate the anolyte from the catholyte through canvas barriers between anode and cathode compartments.

This ARco electroplating method, combined with ARco Rubber Lined Tanks and planned solution circulation, filters metallic insolubles from outside sources.

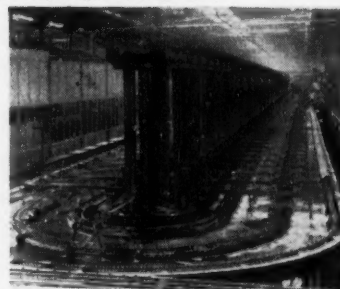
To reduce costly buffing due to roughness . . . prevent rejects resulting from thin spots . . . have an ARco engineer show you how simply Diaphragm Systems can save time, materials . . . and customers . . . for you.



Two Work Lane Diaphragm Plating Tank



Horizontal Diaphragm Installation



Vertical Diaphragm Installation

For uniformly high quality and economy in plating . . .

# DIAPHRAGM SYSTEMS *and* RUBBER LINED TANKS *by ARco*



GET THIS VITAL PLATING INFORMATION...SEND COUPON TODAY!

"Diaphragm Tanks Promote Plating Progress." This explanatory, illustrated booklet is yours without obligation. Send for it today!



● ARco fabricated and insulated Diaphragm Plating Tank, return bend type.

Licensed  
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Applicators



Anything can be  
covered with  
rubber - by ARco

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Detroit 39, Michigan

Please rush me \_\_\_\_\_ copies of your "Diaphragm Tanks Promote Plating Progress."

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**AUTOMOTIVE RUBBER CO.  
INCORPORATED**

Manufacturers • Designers • Engineers

12572 BEECH ROAD • DETROIT 39, MICH.

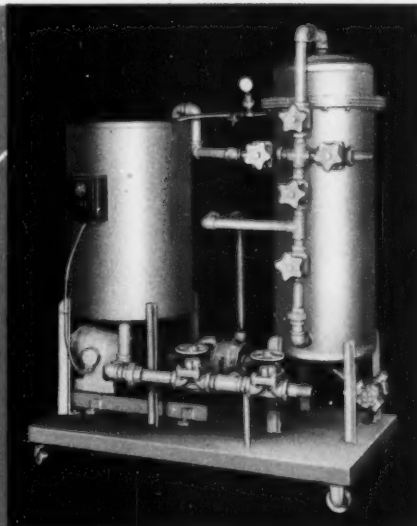
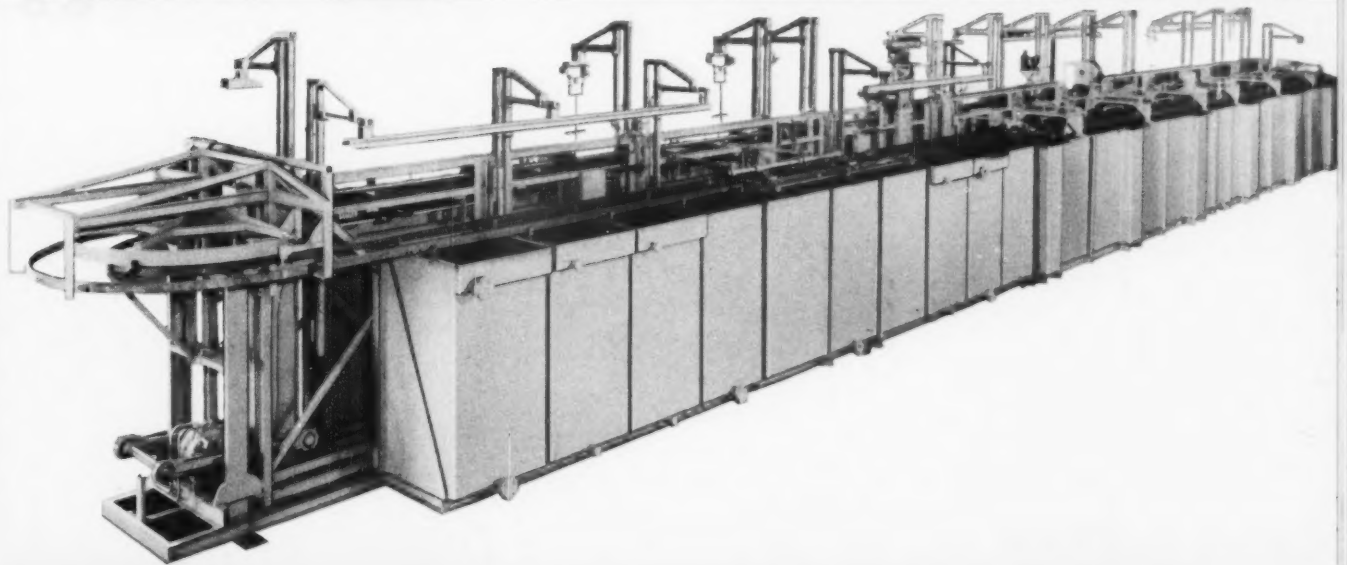
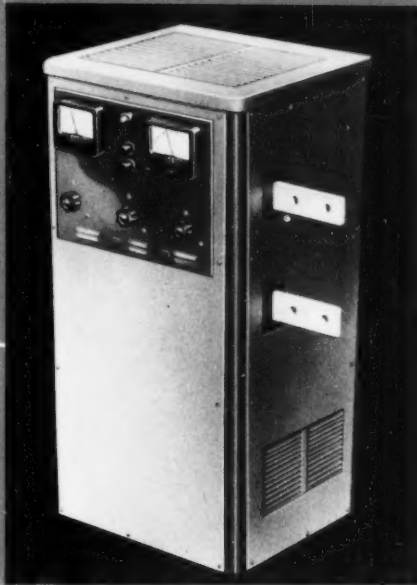
**ARco RUBBER PROCESSORS**

4033 HOMESTEAD ROAD • HOUSTON, TEXAS

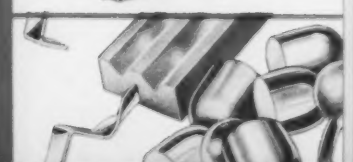
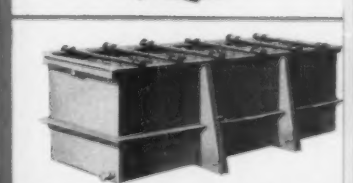
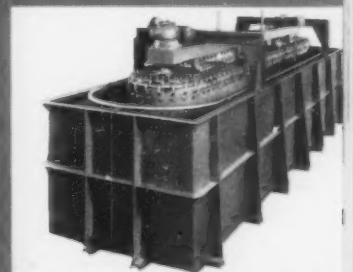
tomorrow's equipment today

# WAGNER BROTHERS

automatic plating  
equipment and supplies



RECTIFIERS  
AUTOMATICS  
SEMI-AUTOMATICS  
FILTERS  
TANKS & LININGS  
ANODES  
WASTE TREATMENT SYSTEMS

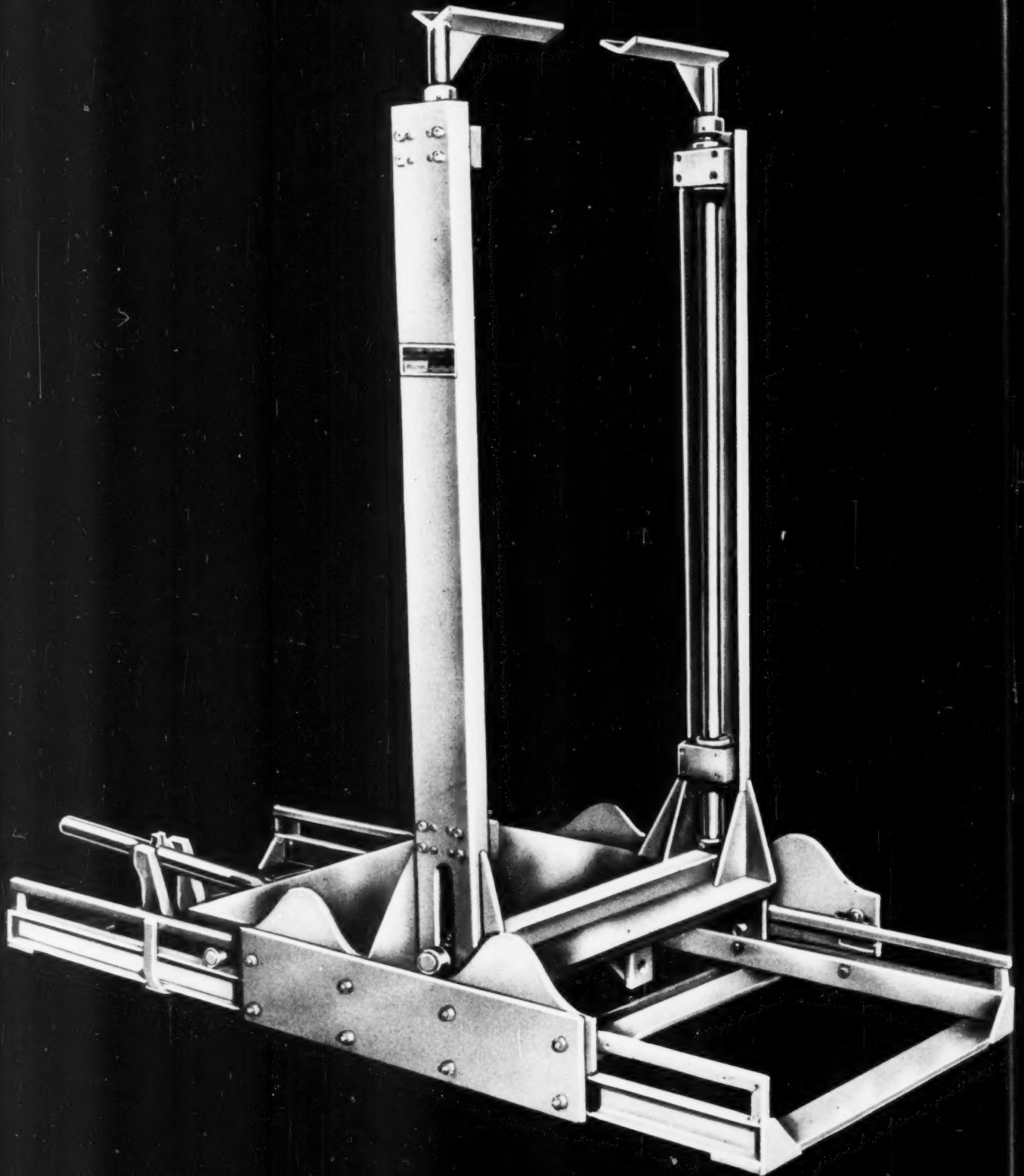


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## Does a man's job . . . heaper, faster, better!

Still manually loading your automatic? Workers complaining about lifting heavy loads? Looking for a way to decrease labor costs, to add several thousand dollars to your net profits? Well, Wagner Brothers' new Auto-Loader can solve your problems!

Because it eliminates expensive manual loading operations, the Auto-Loader costs you nothing—it pays for itself.

It makes no difference what make or type of automatic processing equipment you now have; the Auto-Loader is *easily adapted to any automatic using an intermittent motion*, double or single lane. If desired, Wagner Brothers will engineer it into your present system at a nominal service charge.

Unlike some automatic loaders, the Auto-Loader will accommodate a monorail conveyor operating on different planes—you needn't rebuild your conveyor.

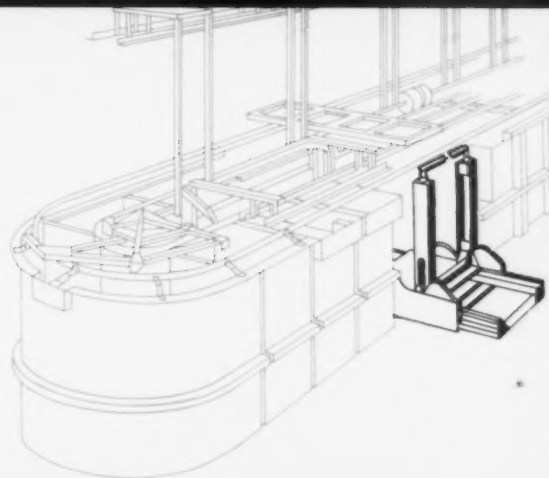
Its rugged construction, absolutely simple design virtually eliminate maintenance headaches, even under continuous heavy service.

All transfer mechanism is mounted on a reciprocating platform, moving on rollers in a channel track. Cam followers attached to the lifting arms duplicate the eccentric contour of the side plates to raise and lower the lifting arms into the loading and unloading positions. The cycle of the Auto-Loader is controlled by the limit switches of the automatic, actuated by a hydraulic cylinder (or an electric drive) to move in perfectly-timed unison with the transfer cycle of the automatic.

\*Patents Pending

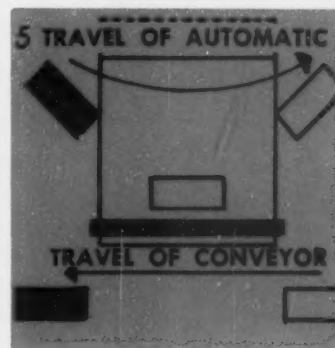
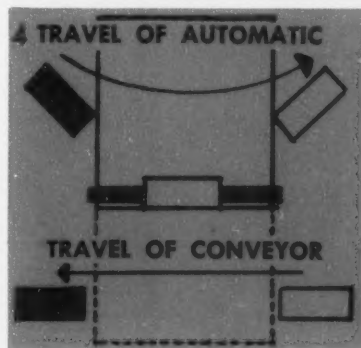
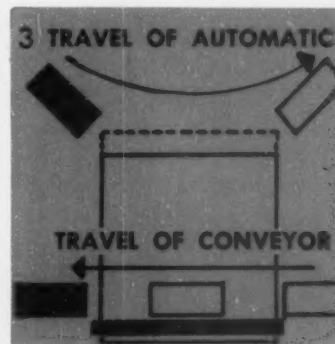
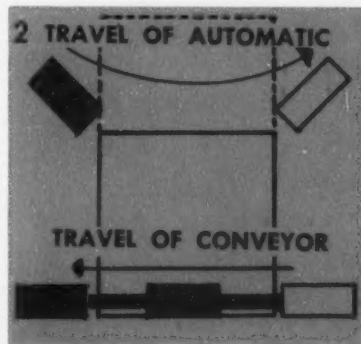
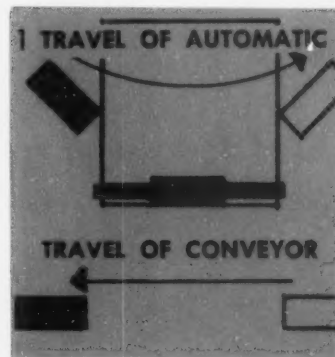
The Auto-Loader can be used for any automatic parts processing operation such as electroplating, anodizing, phosphate coating, etching, electropolishing, oxide coating, painting, cleaning, etc.

**WRITE NOW FOR PRODUCT  
INFORMATION AND QUOTATION**



### OPERATING CYCLE —LOAD & UNLOAD

- 1—Processed rack being unloaded from machine.
- 2—Processed rack loaded on conveyor.
- 3—Conveyor indexing.
- 4—Unprocessed rack loaded on machine.
- 5—Machine indexing.



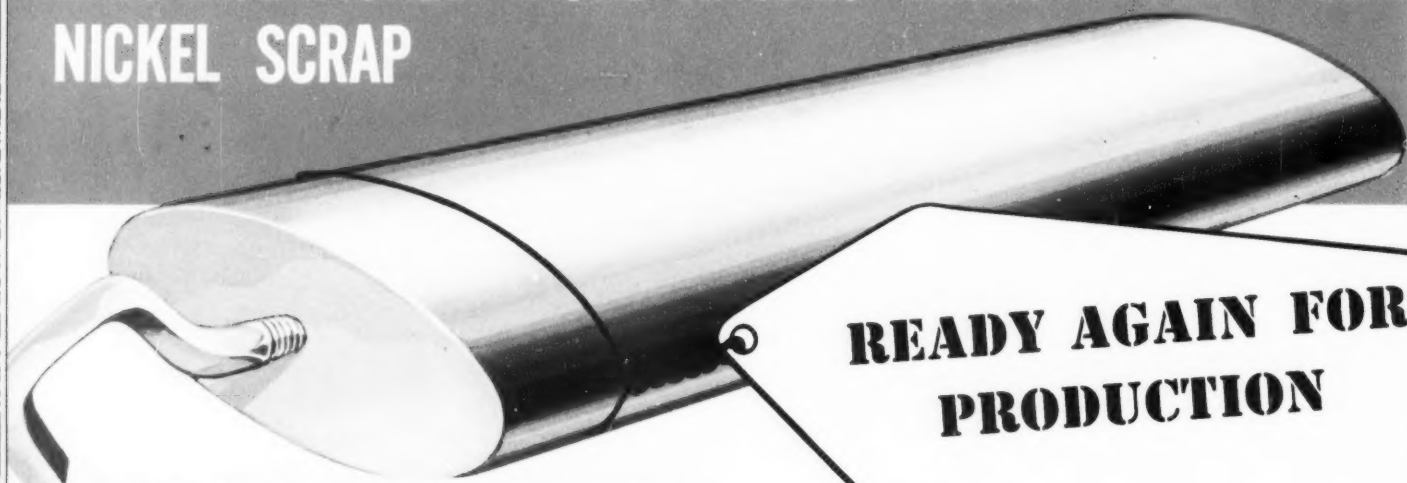
■ PROCESSED RACK

■ UNPROCESSED RACK

# WAGNER BROTHERS, INC.

400 MIDLAND • DETROIT 3, MICH.

# ELECTROLYTICALLY PURE ANODES RECAST FROM YOUR NICKEL SCRAP



**READY AGAIN FOR PRODUCTION**

## CONVERT YOUR "WORTH LESS" NICKEL SCRAP INTO PUREST ANODE FORM

A scrap bin full of useless ends, swords and stubs is "worth less" to you. But we can convert this valuable nickel into production-ready anode form, save you dollars you'd lose selling scrap to dealers and purchasing new nickel anodes.

### HERE'S HOW WAGNER NICKEL RECASTING CAN BENEFIT YOU

- 1. ELECTROLYTICALLY PURE ANODES** — We have a long established reputation for recasting under strictest metallurgical controls — your assurance of 99% pure nickel anodes.
- 2. YOUR SCRAP, YOUR ANODES** — You get your own metal back. We do not pool scrap shipments but process each job with individual attention.
- 3. MODEST HANDLING CHARGE** — You'll be amazed at how inexpensive it is to turn now "worth less" scrap into good anodes. Our fair prices have made us a leading supplier

to the major job plating and manufacturing companies in the metal finishing industry.

- 4. READY FOR IMMEDIATE PRODUCTION** — We'll return your nickel scrap in oval cast shapes, to the length you specify, tapped and drilled for hooks.

### A WORD OF CAUTION

Unless you are *absolutely sure* of your metal broker, we advise against buying nickel scrap of dubious quality. We reserve the right to refuse junk scrap.

**CONSULT YOUR NEAREST WAGNER REPRESENTATIVE OR OUR HEAD OFFICE NOW FOR AN IMMEDIATE QUOTATION**

### POPULAR WAGNER ANODE FORMS

COPPER	NICKEL	ZINC	TIN	BRASS	TIN-LEAD	TIN-ZINC	CADMIUM	ANODE
●		●		●				FLAT-TOP*
●	●	●	●		●	●		ISOCAST OVAL
			●			●	●	CAST BALL
●			●		●			ISOCAST SLAB
●								LECTROCOP†
●								FORGED BALL

†TRADE-MARK

\*REGISTERED TRADE-MARK

**MAIL**

#### WAGNER BROTHERS, INC.

400 Midland Ave.  
Detroit 3, Michigan

*I'd like more information describing the products checked.*

- ☐ Full Automatic Plating Systems
- ☐ Semi-Automatic Platers
- ☐ Electroplating Rectifiers
- ☐ Plating Solution Filters
- ☐ Tanks and Linings
- ☐ Anodes
- ☐ Nickel Brighteners
- ☐ Waste Treatment Systems
- ☐ Nickel Recasting

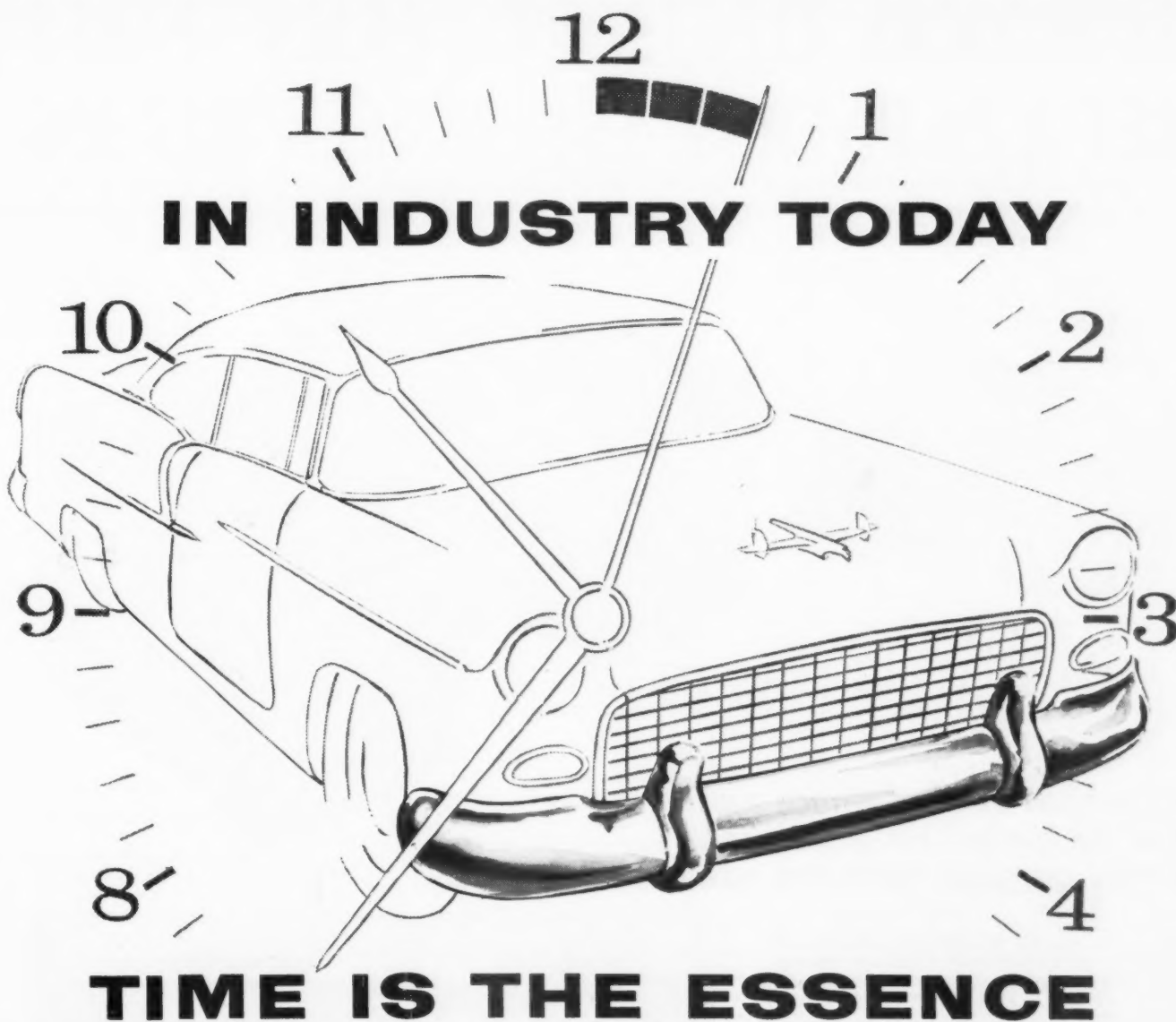
LITHO IN U.S.A.

NAME \_\_\_\_\_ TITLE \_\_\_\_\_

COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_



An automobile bumper chromium-plated every three seconds! This is the rate at one plant where 170,000 square feet of metal are plated daily.

Production of that sort can be maintained only when raw material suppliers have ample capacity and adequate stocks to insure prompt shipment.

Chromium platers who obtain their chromic acid from Mutual are not only assured of receiving a top-quality product, but also careful compliance with their delivery schedule.

**CHROMIC ACID**

•  
**SODIUM BICHROMATE**

•  
**POTASSIUM BICHROMATE**



**MUTUAL CHEMICAL DIVISION**

ALLIED CHEMICAL & DYE CORPORATION

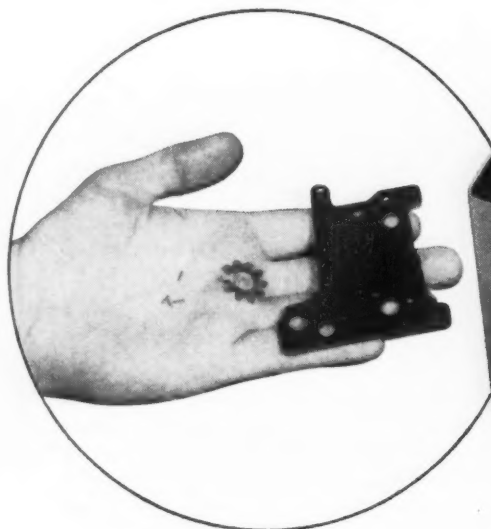
99 PARK AVENUE • NEW YORK 16, N. Y.





# BURROUGHS ELECTRONIC "BRAIN" PARTS GET A Ph.D.\* FROM SUPERSHEEN METHOD

\*POLISHING - HONING - DEBURRING



## **SUPERSHEEN BARRELS REDUCE FINISHING TIME 30 PERCENT ON MORE THAN 25,000 DIFFERENT PARTS FOR BURROUGHS MACHINES**

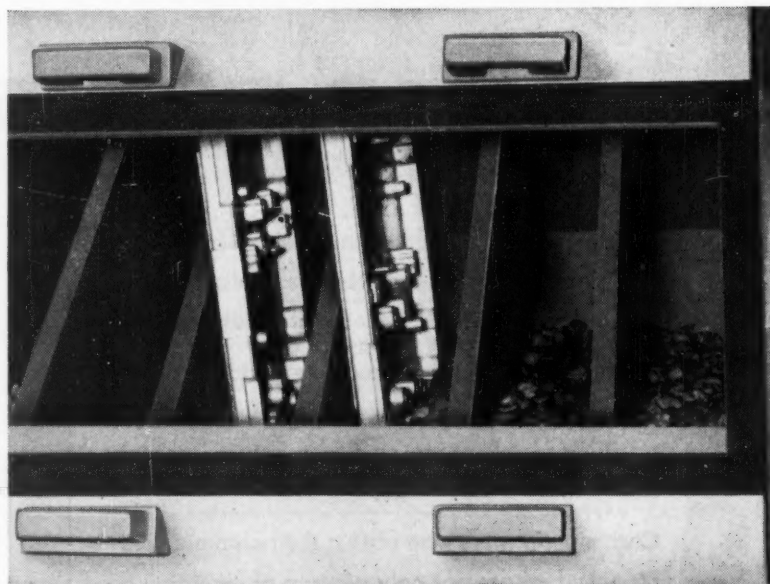
One of the clearest demonstrations of ALMCO SUPERSHEEN Barrel Speed Finishing's versatility can be seen any day at the Burroughs Corporation, one of the world's largest manufacturers of business machines. Here daily hundreds of thousands of parts are precision finished, many to tolerance limits of .0005. The sliding action of the parts and abrasive media and compound solutions produce the well-rounded edges and microinch surfaces so necessary to the perfect operation of these intricately designed machines.

A prime example is the thousands of barrel finished parts that go into the Burroughs E-101 electronic digital computer, the first desk-size "brain" ever manufactured. It solves tough engineering, research and business problems almost with the speed of light! And such speed demands absolutely uniform surfaces on all moving parts—polished, honed and deburred under rigid control.

### **FLEXIBILITY OF OPERATION**

Yet with over 25,000 *different* parts to be barrel finished, ALMCO barrels provide Burroughs with the flexibility so vital to precision finishing. Of special value is the variable speed drive which permits the exact barrel rpm required on any given load of parts; this control produces uniform, mass production of parts of all sizes.

Another time and money saving feature is the automatic timer for barrel finishing parts with long time cycles. At Burroughs, these parts are loaded near the end of the first shift and run unattended for 11½ hours—then automatically stopped by pre-set timers. The first shift then completes final processing.



### **PRODUCTION INCREASED 300% ON FINISHING LARGE CASTINGS**

Production has increased 300 percent at Burroughs on large parts with this multi-compartment type ALMCO barrel you see above. Large parts like these must be kept separate while being speed finished to prevent impingement or peening. Now six large castings can be deburred and honed per hour as compared to the previous hand operation which finished only two in the same time.

With higher production requirements, fixture-type barrels may be used to greatly increase finished output. By properly engineering processes and fixtures, extremely intricate and large parts can be barrel finished at exceptional cost savings.



### 80% MORE PRODUCTION CAPACITY IN 20% LESS FLOOR SPACE

Here's a look at Burroughs' Detroit barrel finishing department. Prior to the installation of 24 ALMCO barrels in 1951, 36 constant speed, hand-fed tumbling machines were used. The change brought a production capacity increase of 80 percent, yet required 20 percent less floor space. And ALMCO semi-automatic handling equipment has helped effect important time savings in the loading and unloading of parts and media.

As the department expanded, new ALMCO units were added; presently,

there are 53 operating at the Detroit and Plymouth plants.

This modern operation at Burroughs speed finishes mill cut, ground, metal stamped and die cast parts, ranging in size from tiny accounting machine pins to large base castings for business machines. To meet exact requirements, finishing information on each of the more than 25,000 different parts is indexed on separate file cards.

These cards specify the time cycles, rpm's, water levels, media and compounds necessary to obtain the proper abrasive and lubricating action. Here, various SUPERSHEEN compounds and media help obtain the precise deburring, honing or coloring of parts.

### ALMCO FINISHING LABORATORIES AND ENGINEERS ON YOUR PROBLEM IN MATTER OF HOURS



ALMCO Sales Engineers specialize only in barrel finishing equipment and materials; this means expert service for your special problems. Branch offices are convenient to most metal finishing centers; thus you can bring in sample parts, see them processed and observe how the SUPERSHEEN METHOD can save you time and money.

**ALMCO** SUPERSHEEN METHOD  
FOR  
SPEED FINISHING

Division of Queen Stove Works, Inc.

ALBERT LEA, MINN.

### BARRELS PROVIDE CONTINUOUS OPERATION WITHOUT DOWN TIME

For this modern department, ALMCO engineers helped Burroughs select various size barrels to provide maximum speed finishing versatility.

These ALMCO Speed Finishing Barrels have provided continuous service without replacement parts or down time since installed in 1951 with exception of occasional barrel relining.

You're assured of the same rugged performance because ALMCO Barrels are constructed of heavy gauge cold rolled steel, rigidly gusseted with  $\frac{1}{4}$ " x  $1\frac{1}{2}$ " flat steel. Extra cabinet strength is provided by the "A" frame plus box frame construction. All frame and supporting members are heavy plates and U channel iron.

Other important construction and design features are: neoprene barrel lining to cushion work parts, improve color and prevent wear on the barrel; magnetic brake with toggle switch for ease of positioning barrel when loading and unloading, and quick-opening and closing cam-type door. Extra heavy chain, sprockets and heavy duty bearings increase service and performance over similar units.



FREE 52-PAGE  
CATALOG SHOWS  
YOU ALL THE FACTS  
ON COST-SAVING,  
TIME-SAVING

### BARREL FINISHING WITH SUPERSHEEN METHOD

This comprehensive catalog is yours for the asking. Packed with facts and photos on America's finest and most complete line of barrel speed finishing equipment. Write: Almco, 412 Marshall Street, Albert Lea, Minn.



# News about COATINGS for METALS

Metallic . . . . . Organic . . . . . Decorative . . . . . Protective

## New Crack-Free Chromium Plate gives superior protection

### Structurally perfect finish from stress-free chromium

Differences in the structure of ordinary chromium and Crack-Free Chromium deposits are shown by the photomicrographs below.

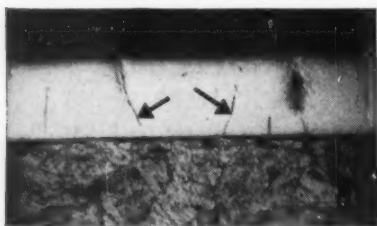


Fig. 1



Fig. 2

**Figure 1** shows a cross section of etched ordinary chromium .00125" thick, with part of its network of cracks. Note that some cracks extend through the deposit to the base metal, providing an unimpeded path for corrosives.

**Figure 2** shows a section of etched Crack-Free Chromium also .00125" thick. Note the complete absence of cracks.

• • •

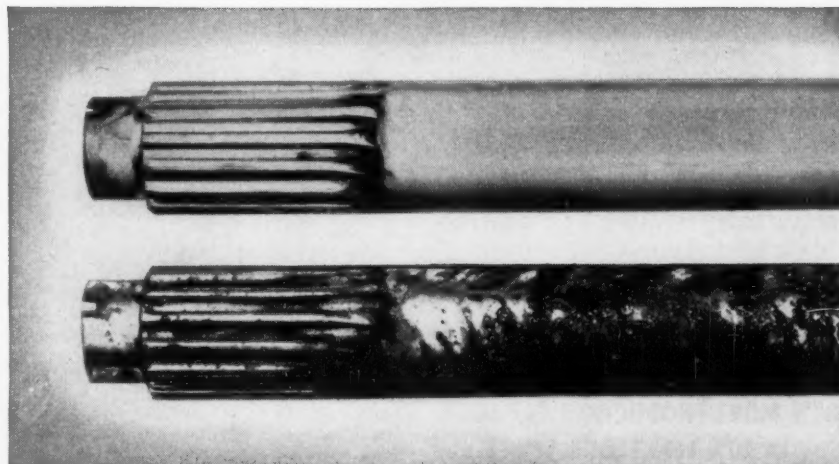
#### UNITED CHROMIUM DIVISION

METAL & THERMIT CORPORATION

100 East 42nd Street, New York 17, N. Y.  
Waterbury 20, Conn. • Detroit 20, Mich.  
East Chicago, Ind. • El Segundo, Calif.

In Canada:

United Chromium Limited, Toronto 1, Ont.



Upper steel shaft, with 0.0005 inch of Crack-Free Chromium, was virtually unaffected after 100-hour salt spray test. Surface of lower shaft with 0.0005 inch of ordinary chromium was completely covered with rust.

A basic need has at last been satisfied. A chromium deposit which gives better protection against corrosion is now obtainable by means of a new process developed by United Chromium.

Unichrome Crack-Free Chromium Plating produces more ductile deposits which are relatively free from internal stress. Thus, deposits do not crack as they are built up to hard plating thicknesses. In this respect they are unlike ordinary chromium which develops cracks, providing corrosives with paths to the underlying metal.

#### EFFECTIVE PROTECTION DIRECTLY ON STEEL

The photograph above shows that .0005" of Crack-Free Chromium plated directly on the steel prevented rusting of shafts subjected to 100 hours of salt spray, while the same thickness of ordinary chromium failed completely.

In other corrosion tests, parts plated with .0003" of Crack-Free Chromium were as good as new after a full year at 100% relative humidity and 110°F whereas parts

with ordinary chromium were entirely covered with rust in days.

For many decorative applications, Unichrome Crack-Free Chromium can be plated directly on steel or zinc base die castings, eliminating need for scarce nickel.

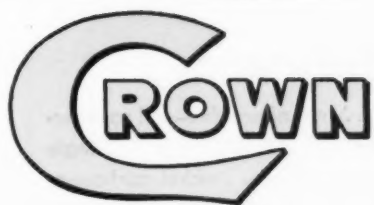
#### OTHER BENEFICIAL PROPERTIES

Crack-Free Chromium deposits are hard (500 to 700 Knoop), have a low coefficient of friction, and a non-galling, non-seizing surface. The plate has superior ductility and resistance to thermal shock. Unusual leveling action is provided by the solution.

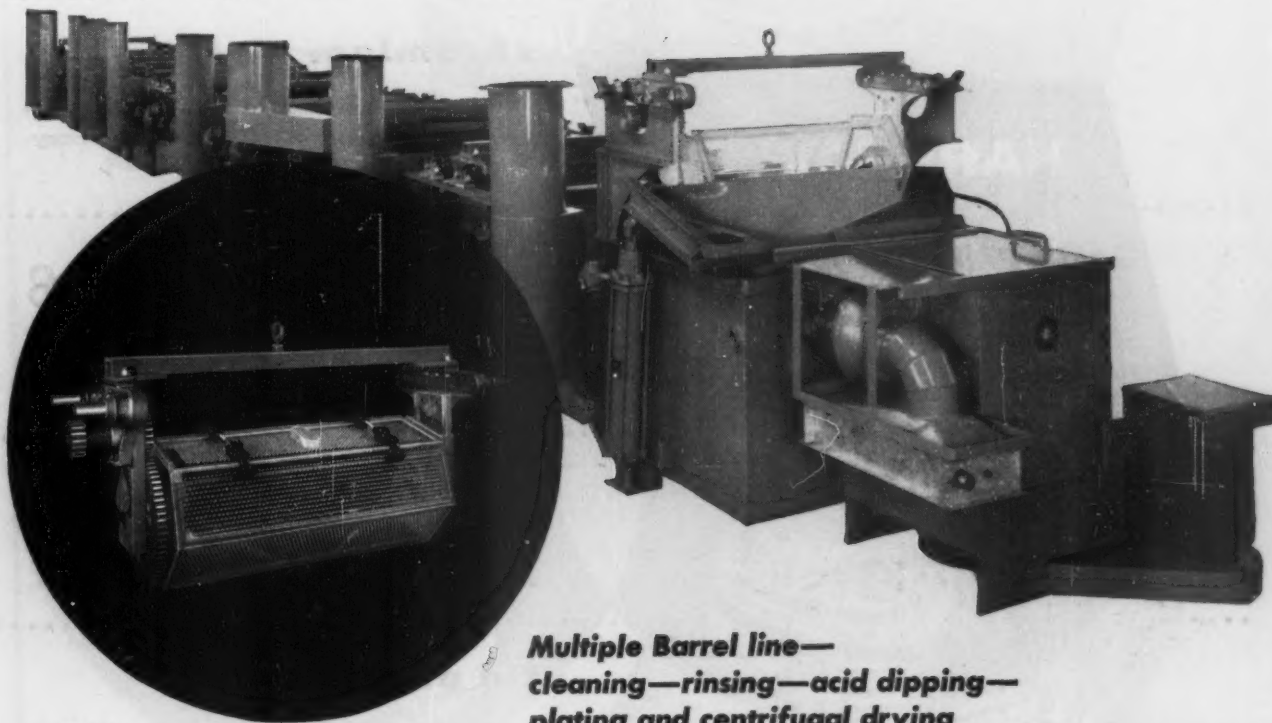
Its grayish, matte finish needs buffing for high luster, but this is done as readily as buffing dull nickel. Attractive two-tone effects can be produced by buffing some areas, leaving others as plated.

Unichrome Crack-Free Chromium has already proved its advantages for hard chromium plating and certain decorative applications in successful commercial operations. Bulletin CFC-1 gives more details. Send for your copy.

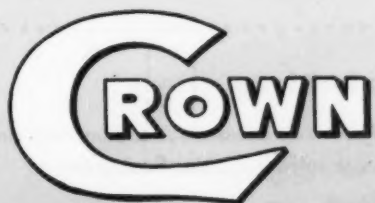




## PLATING BARRELS



**Multiple Barrel line—  
cleaning—rinsing—acid dipping—  
plating and centrifugal drying**



## LUCITE CYLINDERS

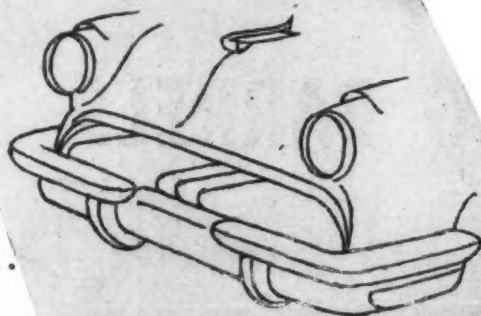
**Can be operated through the entire cycle  
cleaning—rinsing—acid dipping—and plating solutions.**

**Whether your production requires a single barrel  
or a multiple set up for cleaning, rinsing, acid dipping, and  
plating, there are Crown barrels to fit the job.**

*Write for complete details*

**CROWN RHEOSTAT AND SUPPLY COMPANY**

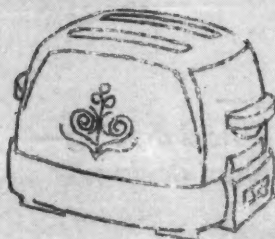
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## **nickel plating**

... still and barrel ... nickel anodes—all commercial grades and sizes ... anode bags ... single nickel salts—nickel chloride ... nickel carbonate ... nickel fluoborate ... boric acid.

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... pure "Krome Flake" 99.8%  $\text{CrO}_3$  ... sulphates less than .10% ... lead, tin-lead and antimony-lead anodes.

## **copper plating**

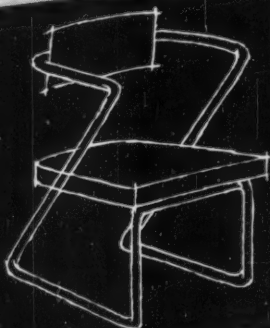
... copper ball anodes ... Rochelle Salts ... sodium and copper cyanides ... copper sulfate ... copper fluoborate.

## **cadmium plating**

... ball and cast cadmium anodes ... cadmium oxide ... sodium cyanide ... cadmium fluoborate.

## **tin plating**

... cast tin anodes ... sodium stannate ... stannous sulfate ... tin fluoborate ... acid tin addition agent.

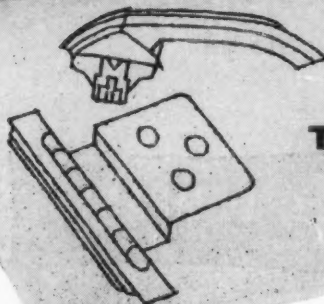


## **zinc plating**

... ball and cast zinc anodes ... sodium and zinc cyanide ... zinc sulfate ... zinc fluoborate.

## **lead plating**

... cast lead anodes ... lead fluoborate.



## **silver plating**

... silver cyanide.

## **THE HARSHAW CHEMICAL COMPANY**

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Please send me more detailed information about your new buffing compounds. I would also like to have your free sample(s) of

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manufacturing company, inc.

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Experience with plating waste treatment has shown staff and consulting engineers that no one process or type of equipment is generally applicable to all problems. Thorough evaluation of the many factors involved is necessary in each case.

Whether the solution required is ion exchange or precipitation Graver has complete equipment to do the job.

### Graver can offer you:

- \*Choice of either basic process and equipment
- \*Engineered flexibility to suit individual requirements
- \*Advanced equipment design proven in hundreds of installations
- \*Over 45 years' experience in the water and liquid treatment field



### WRITE FOR BULLETINS AND TECHNICAL ARTICLES:

WC-103 A — Reactivators • WC-111 — Ion-Exchangers  
T-136 — Plating Waste Solutions — Recovery or Disposal  
T-130 — Ion Exchange A Practical Tool in the Plating Room  
T-123 — Applications of Ion Exchange to Plating Plant Problems



*Industrial Waste Treatment Dept. W-113*

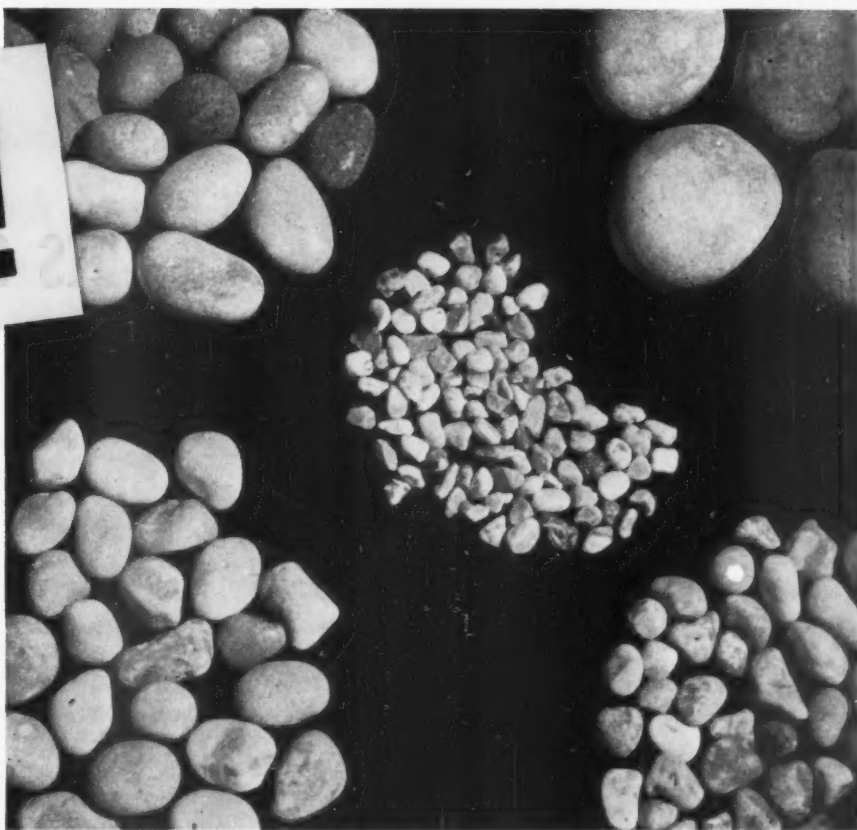
**GRAVER WATER CONDITIONING CO.**

*A Division of Graver Tank & Mfg. Co., Inc.*

**216 West 14th Street, New York 11, N. Y.**

# NEW!

## TUMBLEX "N" Abrasive



PROCESSED BY NATURE and offered exclusively by Norton, the new Tumblex "N" Abrasive comes in sizes ranging from 3/16" by 3/8" to 1 5/8" by 2 1/2".

## A natural for better barrel-finishing

*Latest tumbling abrasive — natural flint stone — offers new  
"TOUCH of GOLD" benefits — brings finish up and costs down*

Tumblex "N" Abrasive is Nature's own tumbling abrasive. Carefully selected and graded by Norton, it opens up new possibilities for barrel-finishing applications such as light deburring, breaking sharp edges, polishing and burnishing and other operations where little actual cut is required.

Tumblex "N" has proved particularly valuable in bringing out the most desirable color of the finished part. Metals on which it has proved its ability to give an excellent finish include zinc, brass, copper, aluminum and various forms of steel, including stainless.

Its rounded, uniform shape and very low breakdown ratio prevent wedging, permit longer cycles and reduce the need of rescreening.

Another big Tumblex "N" advantage is extremely uniform cutting action. This assures the same uniform finishing in load after load. Also, it enables close

regulation of cut; for example, by adding measured quantities of loose abrasive grain to Tumblex "N" you can speed up the rate of cut with little effect on the life of this natural abrasive. Exact formulas for best results in job or production tumbling are easily worked out.

Norton customers who have tested Tumblex "N" Abrasive report:

- "Very good luster with no noticeable wear."
- "Fine performance. Very little breakdown. Reordering 700 pounds of sizes 2 1/2 T and 3 1/2 T."
- "Color O.K. on both zinc and brass."
- "Very long life. Gave excellent color on stainless steel."
- "A good polishing stone on aluminum."

### Send Your Work Samples

Let us demonstrate in our newly enlarged Sample Processing Department how Tumblex "N" Abrasive can give the

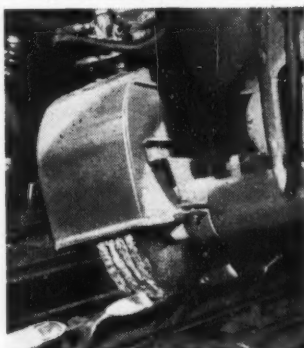
value-adding "Touch of Gold" to your product quality and cut your barrel-finishing time and costs. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. Export: Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass. G-297



*Making better products...  
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ALWAYS FINISHES FIRST



and cuts costs  
two ways because  
it's completely automatic!

fast cutting, easy cleaning with

***Liquimatic***

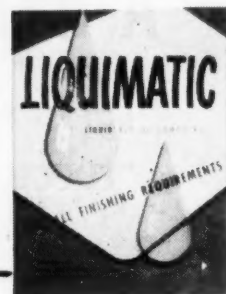
the perfect liquid compound for all metal finishing

What are the two big cost factors in your buffing room? Chances are *buff life* figures big when you're talking production costs . . . and the second big factor is *production time* itself. Liquimatic Application Systems are licking these two cost problems in buffing rooms all over the U. S.—because Liquimatic is automatic. An electrically timed system feeds Liquimatic Buffing Compound to the buff in the exact amount to give you the exact cut you need. Because the buff is continually lubricated, buff life is extended up to 400%!

And with Liquimatic there's no compound wasted, no nubbin problem, no hand application, no changing bars

—think of the cost savings you can effect in *your* buffing room with these advantages! Savings in buff life alone can soon pay for a complete Liquimatic Application System . . . a system that will continue to save you money — *automatically*.

Check the other features of Liquimatic Buffing Compound . . . then write today for your free copy of Liquimatic's big, new folder that tells the whole cost-saving story of Liquimatic in *your* buffing room.



These additional Liquimatic features mean real savings  
in terms of time, money, safety—

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- high flash point
- long storage life
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- adhesive slow-wearing buff face

***Liquimatic*** . . . gives more buff mileage



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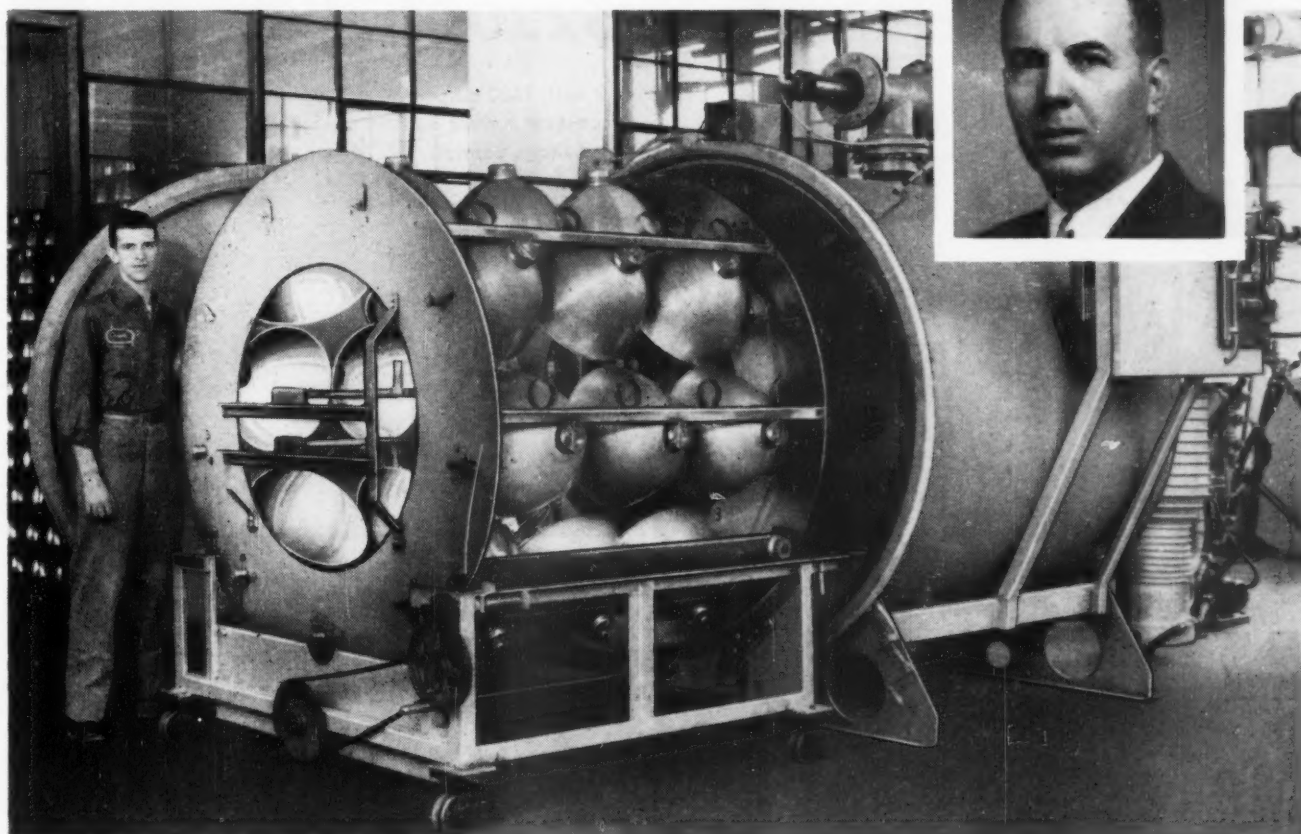
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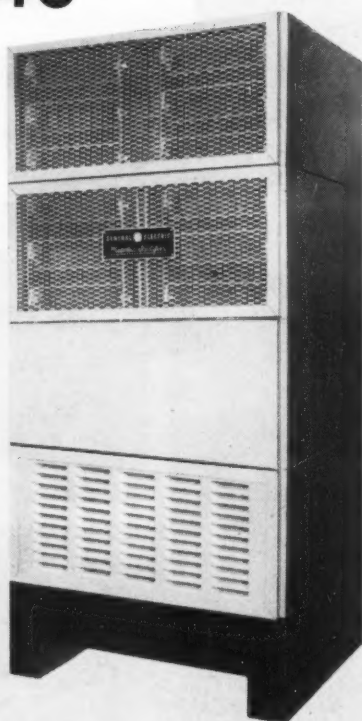
Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

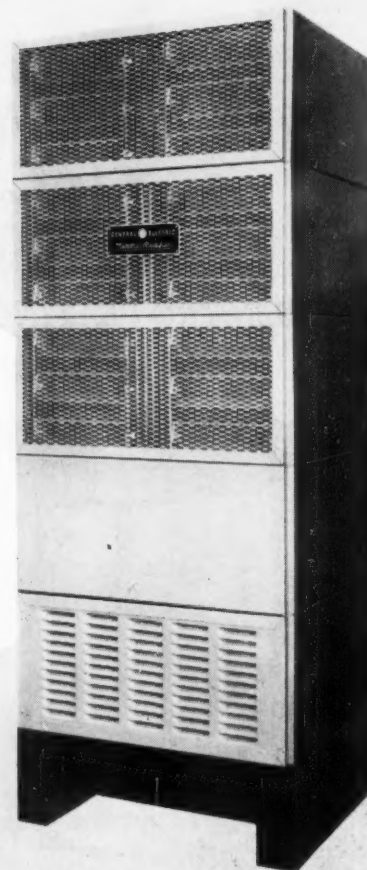
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constant  
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9 volt, 1500 ampere  
constant current and  
voltage control.



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### **TRIM ALLOYS, INC., OF BOSTON SHOWS HOW G-E AUTOMATIC POWER SUPPLIES SAVE LABOR, SPOILAGE, AND MAINTENANCE.**

Lower prices on General Electric automatic plating rectifiers now let you take a big step toward complete automation . . . at low cost.

Besides bringing within your reach the savings of automation, G-E automatic plating power supplies are designed to assure you of uniform plating.

The Trim Alloys, Inc., installation was engineered by The Chemical Corp., Springfield, Mass.

HERE IS THE REPORT OF TRIM ALLOYS, INC., which uses G-E automatic plating power supplies for anodizing aluminum extrusions: "Ours is a high quality process, yet we don't want to waste time, manpower, or materials. In order to maintain our high standards with manual control, we would need a man on the controls all the time. With G-E automatic control, however, we free our operators for other work . . . and get much better control, too. We simply push the start button and the unit seeks its own best setting for that particular load, shutting itself off at precisely the same interval each cycle."

*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**

## COMPARE THE PRICES OF THESE LARGER UNITS

24-volt, 4000-ampere unit with automatic anodizing control—**\$8860\***

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24-volt, 3000-ampere unit with automatic anodizing control and sealed, oil-cooled stacks—**\$8380\***

\* Manufacturer's suggested user price.

# Plating Rectifiers Every Plating Shop

**AN INCREASING NUMBER OF PLATING SHOPS** are discovering that G-E plating power supplies with automatic control cut plating costs in three big areas:

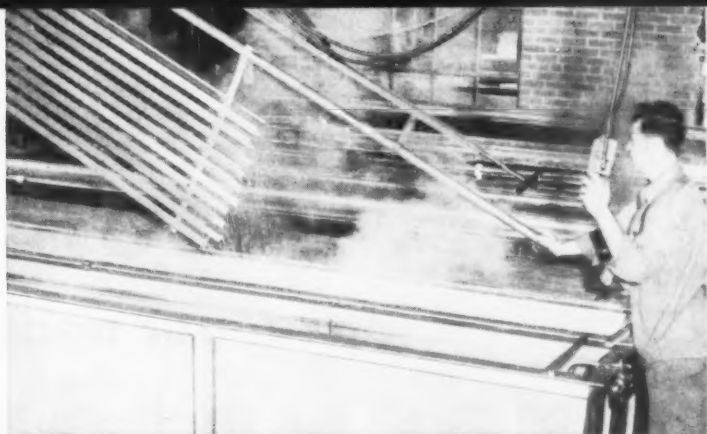
1) **LABOR**—No one needs to stand by the controls to adjust for changes in the tank load. Plating operators can be freed for other operations.

2) **SPOILAGE**—Spoilage is reduced, since deposition is kept uniform by the constant current or voltage. This reduction in spoilage means fewer rejects . . . less re-working expense.

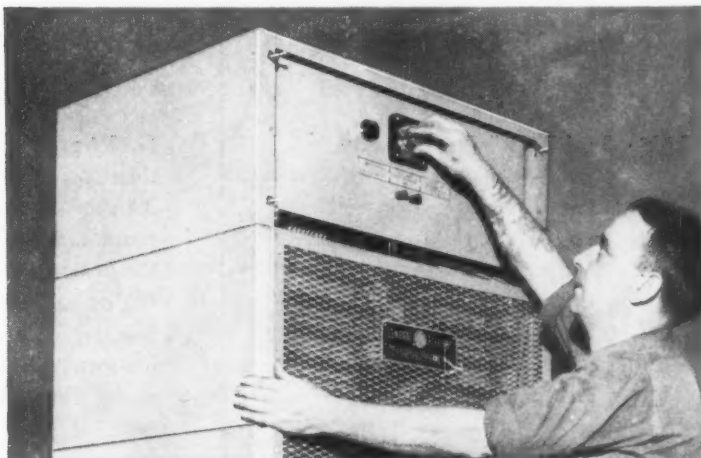
3) **MAINTENANCE**—Maintenance is kept low, because both the G-E automatic control and rectifier are mechanically static. Except for the cooling fan, there are no moving parts.

**BEFORE YOU BUY ANY PLATING RECTIFIER**, check G.E. for the three types of automatic regulation available: (1) voltage, (2) current, and (3) anodizing.

For full details, contact your G-E plating agent, or send in the coupon.



**UNIFORMLY ANODIZED EXTRUSIONS** are removed from the tank at Trim Alloys, Inc. Automatic control, assures uniform, high-quality anodizing every time, resulting in fewer rejects.



**THE DESIRED ANODIZING SEQUENCE** is set up by the operator at the rectifier control panel. Once set, the anodizing sequence is completely automatic, requiring no further adjustment.



**THE REMOTE-CONTROL STATION** is conveniently located within easy reach of the operator right at the anodizing tank.

Section C463-13, General Electric Co., Schenectady 5, N. Y.

I would like to receive additional information on how I can save money when I plate with G-E automatic plating power supplies. Please send me bulletin GEC-970A.

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COMPANY .....

ADDRESS .....

CITY & STATE .....



# POTASSIUM CYANIDE

## 98% KCN

for copper and silver plating—

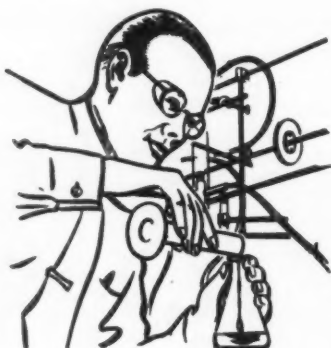
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IN CONVENIENT, DRY FORM

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FROM DU PONT FIELD MEN

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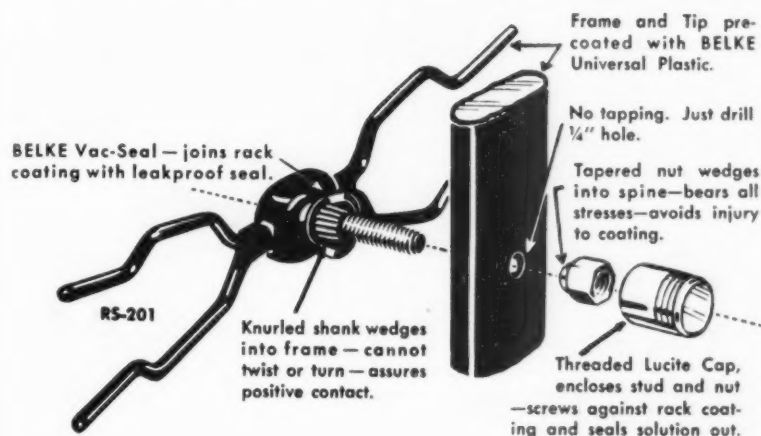


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Cleveland Show



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You can quickly change the tips, change spacing of the tips or convert Thinker Boy Racks to other designs--

With an accumulation of Thinker Boy Members and Tips, you can have specially designed racks for the mere cost of assembly--be ready to plate a new job efficiently in minutes or hours instead of days or weeks.

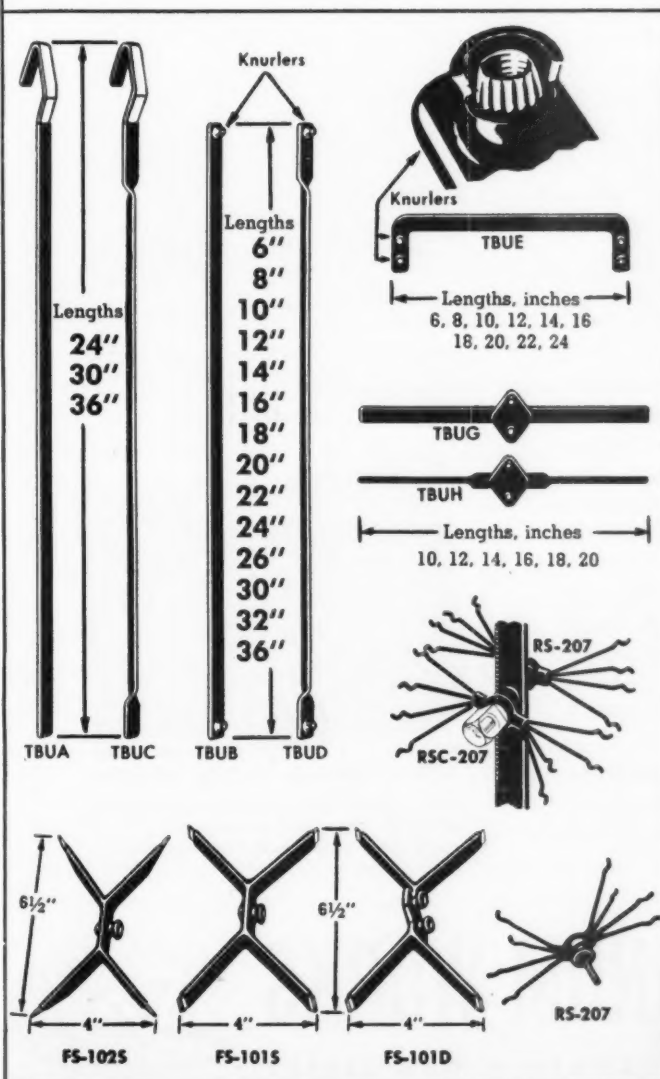
### Amazing Adaptability

Thinker Boy affords amazing advantage in efficiently meeting widely varied racking needs.

You can assemble racks of just about any style or type. You can have the exact tip arrangement and spacing that suits the job. You can adjust Thinker Boy Tips to hold an unbelievable variety of articles.

New literature, just off the press, shows how. Illustrated Thinker Boy Rack Members and Thinker Boy Tips. Shows how to assemble many different types of racks and how to adjust standard Thinker Boy Tips.

Ask your BELKE Service Engineer or write.



**Belke** Manufacturing Co.  
947 N. Cicero Ave., Chicago 51, Ill.  
EVERYTHING FOR PLATING PLANTS

# NEW SHAPED, EXTRUDED APW SILVER ANODES

"RECTANGULAR"



"DOG BONE"



"TEAR DROP"



STANDARD SHAPES

\*Pat. Pending

**CONTROLLED GRAIN SIZE:** APW EXTRUSION PROCESS\* controls grain size within definite limits—minimizes sheddings

The new APW Extruded, Shaped Anodes provide two very definite and important advantages:

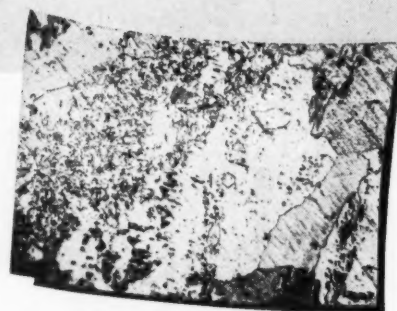
Through controlled grain size, they virtually eliminate shedding and all of its costly results in electroplating.

Their scientifically determined "shapes" prolong considerably the useful life of the anode—with appreciable savings in costs.

The small and uniform grain size produced in the new APW Extruded Anodes is controlled between definite ideal limits. Corrosion is smooth and uniform for consistently smooth electrodeposits. Rejects are a comparative rarity!

The distribution of mass material in the scientifically designed shapes help to maintain a more efficient ratio between anode weight and active surface area. After 85% by weight has been plated off, this APW Anode retains 80% of its original active surface area. You profit with the longer useful life of the anode . . . polarization is minimized . . . there is less silver scrap to be refined.

To be certain the silver you buy in anodes is used most efficiently, APW will develop special anode shapes to meet particular plating bath conditions. We would be pleased to have you consult us on any anode problems you may have.



**ROLLED FLAT PLATE  
ANODE SECTION:**

This Photomicrograph shows highly irregular, uncontrolled grain size—a major cause of shedding and resultant rough electrodeposits.



**APW EXTRUDED ANODE SECTION:**

Note small, fully controlled regularity of grain size that promotes uniform corrosion, smoothest electrodeposits, less rejects.

## THE AMERICAN PLATINUM WORKS

231 NEW JERSEY RAILROAD AVENUE • NEWARK 5, NEW JERSEY





DOW

# DOW SODIUM ORTHOSILICATE



Improved recessed-head lever-lock grips tighter, yet opens and closes more easily; full open-head makes *all* contents readily accessible.

exclusive, improved all-steel drum with  
full open-head and sturdy lever-lock  
brings you new  
shipping, handling and storage advantages

The completely new Dow Sodium Orthosilicate "package" makes an even *better* buy of this *preferred* heavy-duty cleaning compound. Exclusively Dow's, the all-steel drum now available ships better, handles easier, saves you valuable storage space.

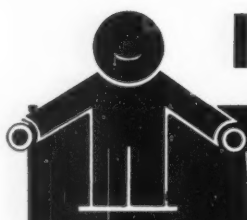
Notice the improved swedged-in head design, and the recessed-head lever-lock. These features reduce the chances of drum damage in shipping or storage. A tighter seal is obtained, along with full accessibility to the last scoopful

of Sodium Orthosilicate. This sturdy drum is the ideal container under conditions of dampness and heavy moisture. And don't overlook its salvage value.

You can get Sodium Orthosilicate in the new drum from Dow plants and distributors. Add its advantages to these *recognized* benefits of Dow Sodium Orthosilicate: uniform high quality and dependably prompt delivery. Result: more good reasons for placing your order with Dow. THE DOW CHEMICAL COMPANY, Midland, Michigan.

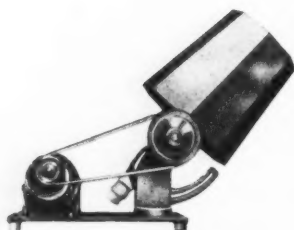
*you can depend on* DOW CHEMICALS

DOW

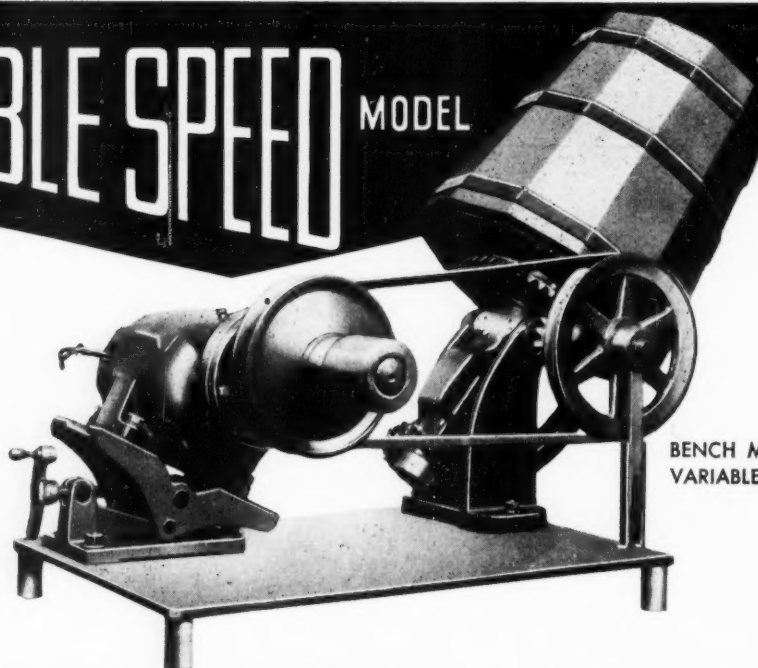


# INTRODUCING—our NEW

## VARIABLE SPEED MODEL



Bench-Type Single Speed



BENCH MODEL  
VARIABLE SPEED

### Note Carefully These IMPORTANT POINTS

Barrels can be filled with parts or abrasive—while running.

Work can be watched — samples removed for inspection — while running.

Angle can be changed for best abrasive or polishing action — while running.

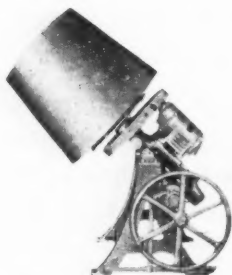
Barrels can be emptied by tilting to pouring position — while running.

Barrels are made in various sizes, shapes, and materials. They are easily replaced.

If You're a Tumbler, Send  
for This NEW CATALOG

**THE HENDERSON BROS. COMPANY**  
*"The Tumbling Barrel People"*

133 SOUTH LEONARD STREET  
WATERBURY, CONNECTICUT



No. 6—Single Speed



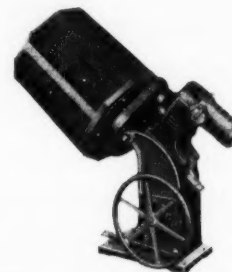
No. 5A—Single Speed



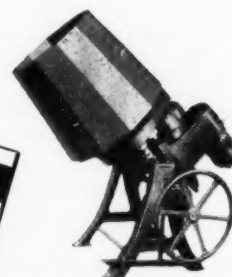
No. 5—Single Speed



No. 5—Variable Speed



No. 5A—Variable Speed



No. 6—Variable Speed



SINCE 1880

DESIGNERS AND BUILDERS OF TUMBLING BARREL EQUIPMENT



# Cut upkeep costs with **"FLOTE"**

... recent water-wash spray booth discovery —  
Only 75 cents a day saves up to \$3500 a year!

**"FLOTE"\* eliminates sinking paint sludge — even with heavy primers; stops clogging, backwall build-up!**

Regardless of the type of water-wash spray booth you use — and no matter what organic finish you use — Wyandotte "FLOTE" will improve operating efficiency, cut maintenance costs. Just add "FLOTE" to your water system!

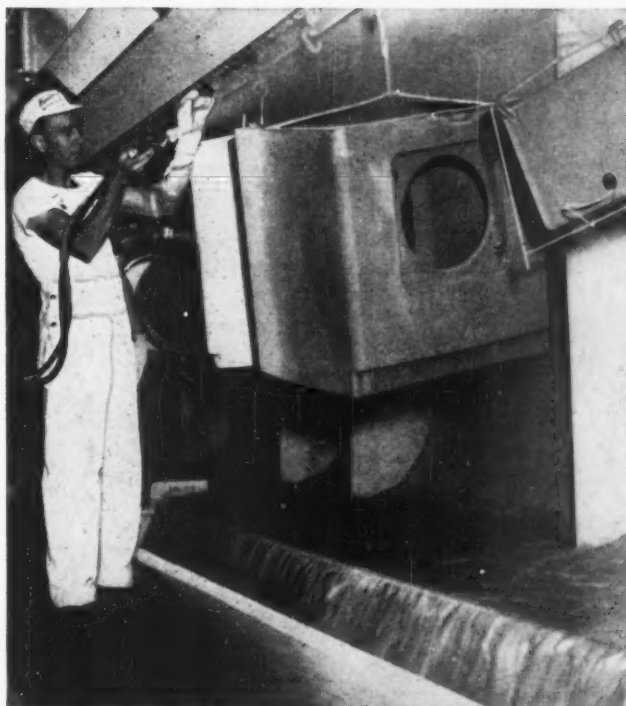
For "FLOTE" floats all types of paint overspray—even heavy primers—and keeps them afloat for easy skimming. Eliminates most foaming problems, too!

Enthusiastic users of "FLOTE" include: one of the world's largest camera manufacturers; a leading farm-machinery company; a large truck-trailer producer; air-conditioning firms; a leading furnace manufacturer; an aircraft factory — even a mammoth auto maker . . . plus appliance and furniture manufacturers, and many, many more!

If you'd like to float away your spray booth problems, and cut maintenance costs, mail coupon for full data on Wyandotte "FLOTE." Do it today!

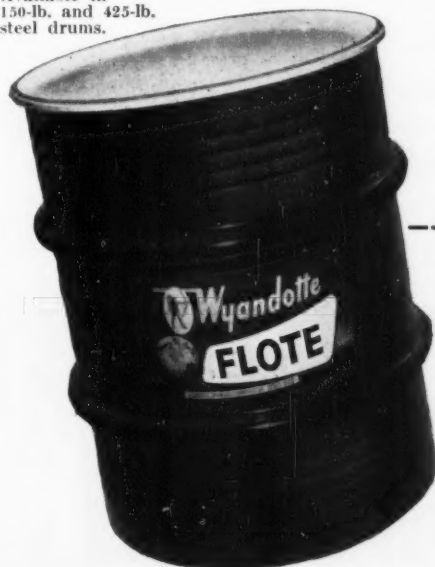
Wyandotte Chemicals Corp., Wyandotte, Mich.  
Also Los Nietos, Calif. Offices in principal cities.

\*PATENT APPLIED FOR



In a water-wash spray booth, like the one above, as little as 75 cents worth of "FLOTE" a day can save you up to \$3500 a year! "FLOTE" is a complete product — nothing else to add!

Available in  
130-lb. and 425-lb.  
steel drums.



## Wyandotte CHEMICALS

J. B. FORD DIVISION

WYANDOTTE CHEMICALS CORPORATION  
Wyandotte, Michigan

Send me further data on "FLOTE" ☐  
Have a representative call ☐

Name

Firm

Address

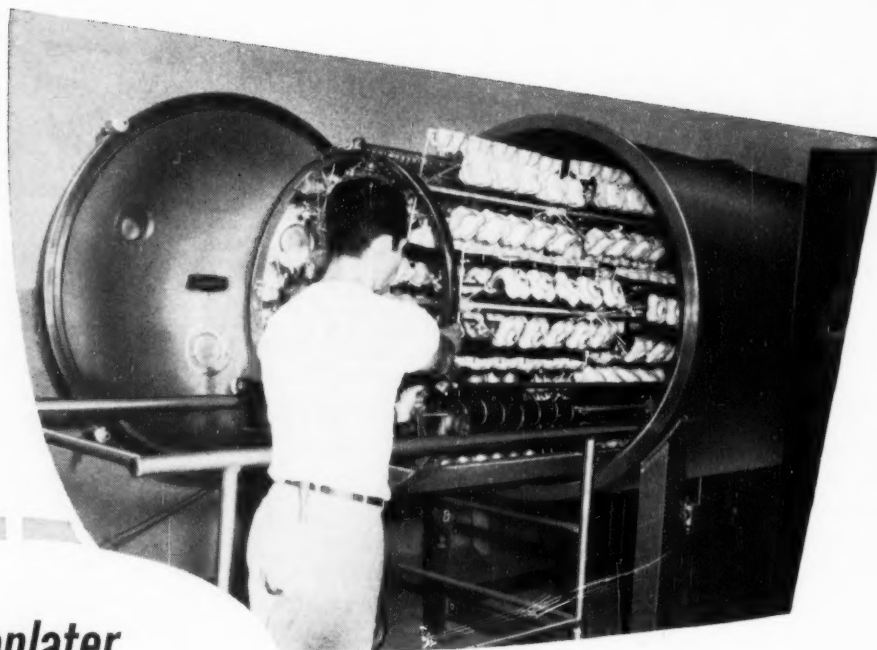
City  Zone  State

LARGEST MANUFACTURER OF SPECIALIZED CLEANING PRODUCTS FOR BUSINESS AND INDUSTRY





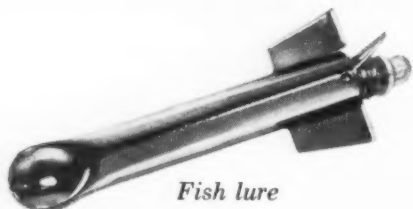
A rack with baby bottle warmers is loaded into a Stokes vacuum plating unit at Specialized Plating Company. Vacuum plated pieces have a bright, durable finish as shown in the completed metal products above and below. Vacuum plating can also be applied to glass, plastics, textiles, and paper, giving the custom finisher broad opportunities.



## Custom Electroplater Cuts Costs 50% through Vacuum Plating



*Lamp base*



*Fish lure*



*Light swivel*

Specialized Plating Company of Los Angeles, California, estimates that vacuum plating saves them 50 to 60% over electroplating on typical parts such as those shown. This custom finishing firm uses a 48-inch Stokes

vacuum plating unit to apply functional and decorative coatings to a broad range of metal parts.

Vacuum plating provides a low-cost, durable, non-tarnishing finish on metals. Endurance—by salt-spray tests—is up to ten times that of electroplated finishes. The process deposits a lustrous aluminum coating on all types of die castings, steel stampings, aluminum spinings and slush metal. Polishing and buffing operations are eliminated.

Stokes makes vacuum plating units in 24, 36, 48 and 72-inch sizes and has a fully equipped laboratory where your samples can be plated. Through the Stokes Advisory Service, complete engineering advice on production and plant lay-out is at your disposal. Write for your copy of an authoritative illustrated brochure on this low-cost finishing method.

F. J. STOKES MACHINE COMPANY  
PHILADELPHIA 20, PA.

# STOKES

OFFICES IN PRINCIPAL CITIES  
REPRESENTATIVES THROUGHOUT THE WORLD

**premium copper demanded**

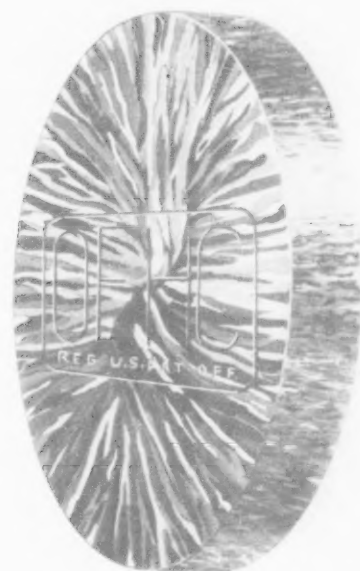
**by electronics engineers . . .**

**Oxygen**

**Free**

**High**

**Conductivity\***



Actual-size reproduction of etched cross-section of oval OFHC Copper Anode. Note characteristic crystal structure.

**. . . now available as anodes for the plating industry**

\*OFHC. Registered Trademark,  
The American Metal Co., Ltd.

Three shapes available in all lengths from 18" to 93".



Round, 3" dia



Oval, 2" x 3"



Round, 2" dia

Get free booklet telling fully why OFHC Copper Anodes will help your plating operations. Write today to your local distributor or nearest address below and ask for Publication CA-10.

OFHC Copper has long been noted for its unique performance in specialized applications which demand extremely high purity and low porosity, such as the manufacture of precision vacuum tubes and other electronic devices. Recently made available to the plating industry, OFHC Copper Anodes are giving superior results in both acid and cyanide solutions. Their success with metal plating men is indicated by continually increasing sales!

OFHC Copper Anodes are made by a patented casting process which converts specially selected electro-deposited copper *directly* to the anode form. Deoxidizing agents and rolling are thus eliminated. The direct-casting method assures —

- ... complete absence of cuprous oxide
- ... total freedom from residual deoxidants
- ... density of rolled copper

**THE AMERICAN METAL COMPANY, LIMITED**

**New York**  
61 Broadway

**Boston**  
Statler Bldg.

**Detroit**  
Buhl Bldg.

**Chicago**  
1 No. LaSalle St.

**Los Angeles**  
Nat'l Oil Bldg.

# THE ANSWER TO YOUR TANK HEATING PROBLEMS

FOR ACID HEATING JOBS

FOR ALKALINE HEATING JOBS



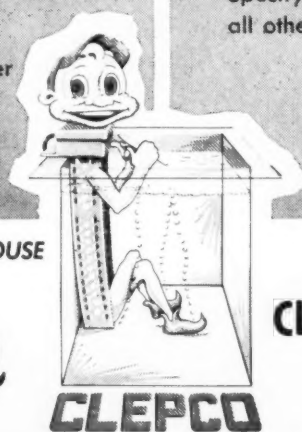
## G SERIES FUSED QUARTZ IMMERSION HEATERS

Over 40,000 CLEPCO Fused Quartz Heaters now in service.

Dependable, controlled heat at low operating cost.

Wide range of Standard Sizes for every need.

Only Fused Quartz Heater recommended and sold by all leading plating supply houses.



SEE YOUR PLATING SUPPLY HOUSE

# Clepco

CLEPCO

## W & WS SERIES STEEL AND STAINLESS IMMERSION HEATERS

Specify CLEPCO Non-Magnetic Stainless Steel Heaters for your alkaline electro cleaners and bright copper plating tanks.

Specify CLEPCO Steel Heaters for all other alkaline tanks.

All leading Plating Supply Houses can furnish from stock.



WRITE US FOR LITERATURE

## CLEVELAND PROCESS COMPANY

1965 EAST 57th STREET  
CLEVELAND 3, OHIO

## Another fine product made finer . . .

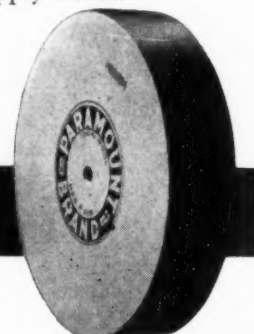


## with the PARAMOUNT "Finishing Touch"

"We find Paramount Felt Wheels best for our ticklish finishing problems," says J. Gaspari and Co., Inc., renowned makers of eyeglass frames. "The samples (illustrated) are a good example. Thanks to the controlled finishing your wheels allow, we are able to remove high solder spots on the frame and temple which must be lapped smooth without damaging the gold shell. We also use your wheels to finish the aluminum plaques because they cut and smooth in one operation."

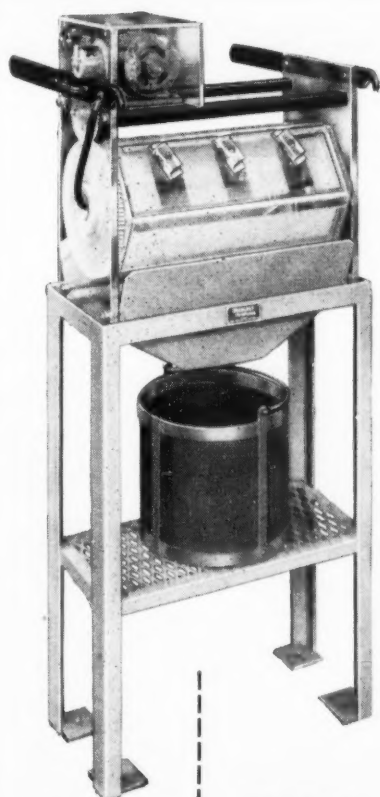
From heavy castings to delicate jewelry, whatever your product, Paramount Felt Wheels can save you time and money. Call your supply house.

*Paramount*  
Felt Wheels,  
Bobs, Sheet Felt



**Bacon Felt Co.** 437 West Water St., Taunton, Mass.





# STUTZ

## Portable Plating Barrels

- ★ The Stutz Portable Barrel is made in 2 standard sizes with cylinders having inside dimensions of 6" x 12" and 8" x 18", I. D., and smaller upon application. Standard openings are 3/32". Smaller or larger openings can be furnished as required.
- ★ Baskets in perforated metals or wire mesh.
- ★ Load/Unload Stand for convenient and fast handling of work load.

### MADE IN TWO STANDARD SIZES

Standard Openings .....	3/32"
6" x 12" I. D. ....	\$186.50
8" x 18" I. D. ....	\$295.00
Stand .....	\$ 39.50
Perforated metal .....	\$ 9.15
Wire mesh .....	\$ 6.15

Write for  
Our New  
Catalog . . .

"Complete metal finishing equipment & supplies"

**GEO. A. STUTZ MANUFACTURING CO.**  
4430 CARROLL AVE. CHICAGO 24, ILL.

Serving  
Industry  
35 Years

# ***AT LAST***

## **A CLEANER that does a better job ...and without heat — INTERNATIONAL-504**

Remove shop dirt, oil, grime and compounds from metal quickly... and completely at room temperatures. That in brief is the story of International-504, the new amazingly efficient cold cleaner for washing machine use.

International-504 is a blend of specially compounded detergents, wetting agents, high-solvency-power naphthas and solvents that literally dissolves dirt. When left on the work after cleaning, International-504 provides an excellent, temporary rustproofing film.

In terms of lower cleaning costs and more effective results, it will pay you to get the facts about International-504—the superior cold cleaner.



## **INTERNATIONAL CHEMICAL COMPANY**

*Specialists in Cleaners and  
Coolants for Industry*

2628 N. MASCHER STREET  
PHILADELPHIA 33, PA.

## **HEAVY PRODUCTION BACKSTAND IDLERS**



### **Universal Model—**

*Sets on floor; mounts  
on wall or ceiling.*

### **Features of BELT MASTER BACKSTAND IDLERS**

- Increased production—Tracking and belt tension controlled from operating position.
- Saves Belts—Tracking adjustment moves idler pulley from side to side instead of turning the face—avoids twisting and stretching to break the bond.
- Tracks all belt widths, 1/4 to 6", perfectly.
- Quick Belt Change. A single motion releases or tightens belt.
- Balanced, 10" idler pulley, 5" wide, with closed ends.
- Grease-packed heavy duty Seal Master ball bearings.
- Proved on the Heaviest of Heavy production lines.



### **Pedestal Base Model— keeps belt level**

*Order from your Jobber  
or write for literature*

**MATHEU TOOL WORKS**  
2426B North Clybourn Chicago 14, Ill.

# Christmas Greetings

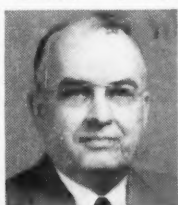
TO OUR FRIENDS IN THE METAL FINISHING INDUSTRY  
from THE STEVENS TEAM



W. J. Cluff  
Detroit, Mich.



A. B. Hoeter  
Detroit, Mich.



F. Watt  
Detroit, Mich.



G. A. Cummings  
Detroit, Mich.



D. Swaninger  
Detroit, Mich.



A. Kirkpatrick  
Detroit, Mich.



J. Barton  
Detroit, Mich.



J. D. Johnson  
Detroit, Mich.



H. Moser  
Detroit, Mich.



J. R. Heizmann  
Detroit, Mich.



R. Amis  
Detroit, Mich.



W. Thompson  
Detroit, Mich.



L. V. Gagnon  
Boston, Mass.



C. A. Mitchell  
Springfield, Ohio



C. J. Menzemer  
Buffalo, N. Y.



L. H. Tressler  
Buffalo, N. Y.



H. Faint  
Chicago, Ill.



G. D. Stevenson  
Cleveland, Ohio



H. M. Brown  
Dayton, Ohio



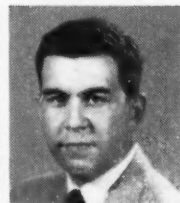
B. Jacoby  
Dayton, Ohio



L. Singer  
Detroit, Mich.



E. C. Elliott  
Geneva, N. Y.



P. H. Norton  
Grand Rapids, Mich.



R. J. Connelly  
Hamilton, Ohio



R. Bender  
Indianapolis, Ind.



R. Hoff  
Jackson, Mich.



T. R. Williams  
Mansfield, Ohio



R. J. Brown  
Detroit, Mich.



H. M. Stevens  
New Haven, Conn.



W. T. Lynch  
New Haven, Conn.



K. Levensalor  
New Haven, Conn.



E. King  
New York, N. Y.



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**FREDERIC B.  
STEVENS**  
INCORPORATED  
YOUR METAL FINISHING SUPERMARKET  
DETROIT 16, MICHIGAN



W. Rolak  
Detroit, Mich.



# NEW

## STANDARD

### PLATING RACK COMPANY

1913-25 N. Paulina St.

Chicago 22, Ill.

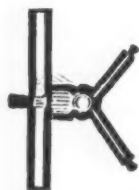
**"Stand-It-All" Rack Patch** does the complete patching job on your insulated plating racks. One or two coats are ample and it is air dry.

AVAILABLE IN  
EASY TO APPLY  
TUBES

Packages of  
One Dozen  
Two Dozen  
and  
Gross Lots



It's a must for patching after making a  
tip replacement . . .



*a squeeze always results in satisfaction*

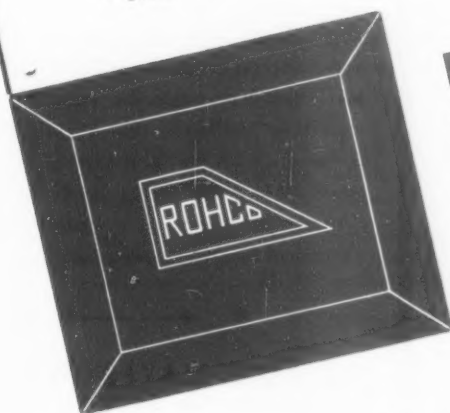
A STANDARD PRODUCT OF THE "WORLD'S LARGEST PLATING RACK MANUFACTURERS"

AIRCRAFT BLACK CADMIUM DIP



On Christmas Eve we love to sing,  
Of old-fashioned friendships which make the heart ring!  
And may the New Year with its promising days,  
Bring blessings to you in dozens of ways!

"Merry Christmas and a Happy New Year"



**R. O. HULL & COMPANY, INC.**  
1301 Parsons Court

Rocky River 16, Ohio

"THE HULL CELL TEST MAKES PLATING BEST"

ROHCO 20XL CADMIUM BRIGHTENER

• ZINC PURIFIER

HANGING HULL CELL

• ROHCO 303 STILL ZINC BRIGHTENER

• ROHCO 100 BARREL ZINC BRIGHTENER

PERMA-BRITE S STILL ZINC BRIGHTENER

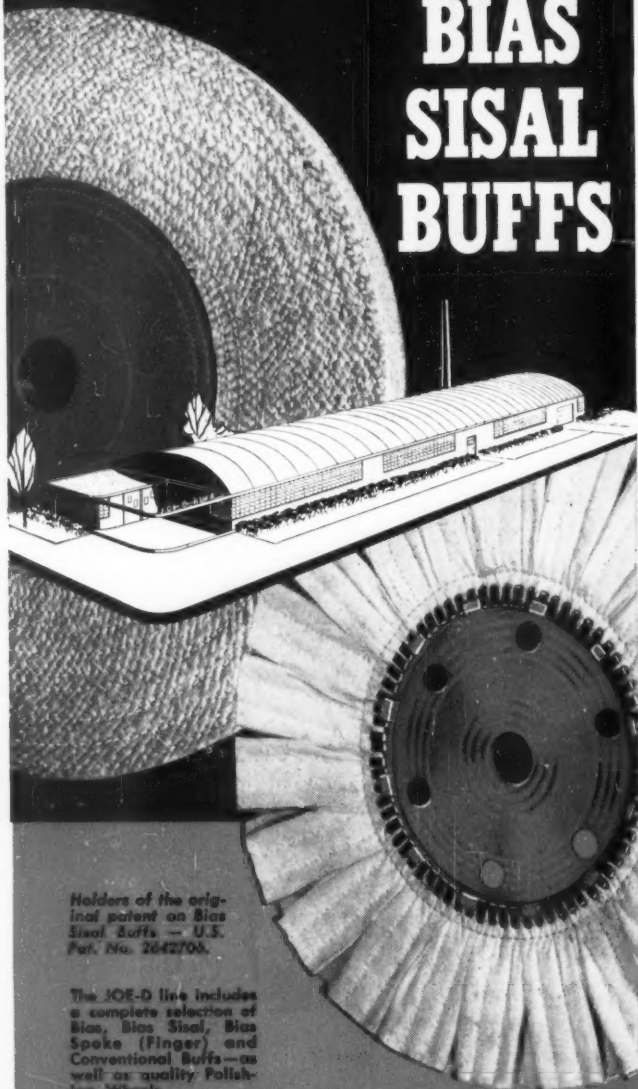
• PERMA-BRITE B BARREL ZINC BRIGHTENER

• RINS-AID

# The "House that Sisal Built"

## JOE-D ... Originators of

### BIAS SISAL BUFFS



Holders of the original patent on Bias Sisal Buffs — U.S. Pat. No. 2642705.

The JOE-D line includes a complete selection of Bias, Bias Sisal, Bias Spoke (Finger) and Conventional Buffs—as well as quality Polishing Wheels.

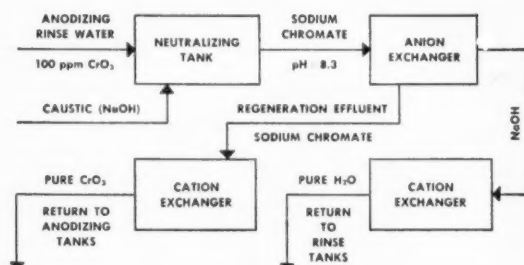
Since its founding, the JOE-D Buff Company has specialized in Sisal—constantly experimenting and testing ways to give you faster-cutting, longer-lasting Sisal Buffs. Made of the finest quality imported sisal, specially woven and processed for guaranteed fray-proof performance . . . never a loose end to whip or scratch . . . always an even nap to hold compound and provide better color. For every Sisal Buff requirement, specify JOE-D, the original—and still America's finest—Bias Sisal Buff.

**ATTENTION JOBBERS:** Some choice territories still available. WRITE TODAY!

**the JOE-D Buff Company**  
SANDWICH, ILLINOIS • TELEPHONE 2171

## ILLCO-WAY

### ionXchange



### RECOVERY OF CHROMIC ACID FROM ANODIZING RINSE WATER

The block diagram above indicates one method of using ionXchange to save money, in the plating rooms of a large automobile plant, by recovering the chromic acid from the rinse tanks of anodizing operations. The cost of equipment was much less than the cost of a disposal plant, and the savings through recovery were substantial enough to make the investment a very profitable one.

### REMOVAL OF ALUMINUM FROM ANODIZING BATH

A secondary purpose for one part of the same installation was the removal of aluminum from the anodizing baths. When the concentration of aluminum in any anodizing tank rose to nearly 1 g. per liter, that tank was cycled through the cation exchanger and the aluminum removed, thus saving over \$250 a week compared with partial dumping. For details on this and many other money-saving applications of ILLCO-WAY ionXchange, write us or consult your Illinois Water Treatment Company representative.

**ILLINOIS WATER TREATMENT CO.**  
840 CEDAR ST., ROCKFORD, ILLINOIS

**ILLCO-WAY** **ionXchange**

NEW YORK OFFICE: 141 E. 44TH ST., NEW YORK 17, N.Y.  
CANADIAN DIST. PUMPS & SOFTENERS, LTD. LONDON, ONT.



# FISHING FOR WAYS TO CUT ELECTROPLATING COSTS?

KNICKERBOCKER FOUND IN TEST THAT IT CAN

- Cut cost of solution correction
- Cut Power Costs by 1/3 or Boost Production

WITH

## "PLUS-4" ANODES

(PHOSPHORIZED COPPER)

The Knickerbocker Electrotape Co. of New York filled its Tank No. 1 with Anaconda "Plus-4" PhosphORIZED Copper Anodes, set up Tank No. 2 as a control, using only electric tough pitch copper anodes. Solution concentrations are tested and corrections made weekly—and consistently Tank No. 1 with the "Plus-4" Anodes has shown the better record.

After five months of testing, Mr. William Welsh, foreman of the plating department, expressed his satisfaction with "Plus-4" Anodes and made this statement: "Using regular anodes, we must hold our cathodes at least 4½ inches from the anodes. This is necessary because the sludge from the old anodes will fall on our work and cause roughness. With the new 'Plus-4' Anode, there being no loose sludge, we could work much closer—only 3 inches away—which would reduce the resistance by 1/3—which would in turn reduce our power costs by about the same proportion. This would also reduce the heat generated by a like proportion."

Mr. Welsh explained that because Knickerbocker uses thermoplastic molds, heat is important—the tanks must run no higher than 95F to prevent warping. As an alternate to reducing power, he explained that he could use the same power and run plates through faster, increasing production.

55142

### WHY PLATING WITH "PLUS-4" ANODES COSTS LESS!

- + 1 no anode sludge (no "bagging" or diaphragms required)
- + 2 no copper "build-up" in solution
- + 3 smooth, heavy cathode deposits
- + 4 up to 15% more cathode deposit per anode

**SEE FOR YOURSELF**—For details on how you can get a test supply of "Plus-4" Anodes sufficient to fill one tank, write to The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

### "PLUS-4" ANODES

A PRODUCT OF

# ANACONDA®

made by The American Brass Company

For use under Patent No. 2,689,216

Here is a "Plus-4" "fish" pulled out of a Knickerbocker tank. It measures .170" at the thickest part at the bottom and .058" at the thinnest point. This remnant of a 40-lb. anode weighs only 1 lb., 3 oz. "Plus-4" Anodes corrode this way regularly—another indication of the superior job they can do for you.

# You'll Plate Parts Faster AT LOWER COST when You USE The SMOOTHEx



A STOP OFF  
for  
SELECTIVE  
CARBURIZING

for  
DECORATIVE  
PURPOSES

AS AN  
UNDERCOAT

\*Pat.  
Pending

TO PROTECT  
ZINC, ALUMINUM  
and other soft  
metals from attack  
IN ACID NICKEL  
PLATING SOLUTIONS

TO ELIMINATE  
COPPER  
BUFFING

## BRIGHT COPPER PROCESS\*

End your plating solution troubles, now! Switch to the amazing new SMOOTHEx BRIGHT COPPER PROCESS for greater brilliance, speed and top quality, lower cost runs. Your present equipment can quickly and easily be adapted to the Smoothex Process. Send a sample of your plating solution to us, at once, for conversion information.

- ELIMINATE COPPER BUFFING
- SAVE NICKEL
- EASE OF CONTROL
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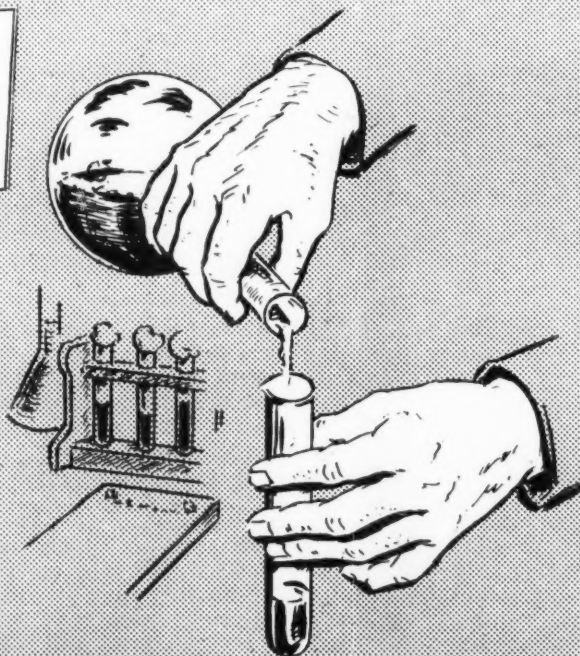
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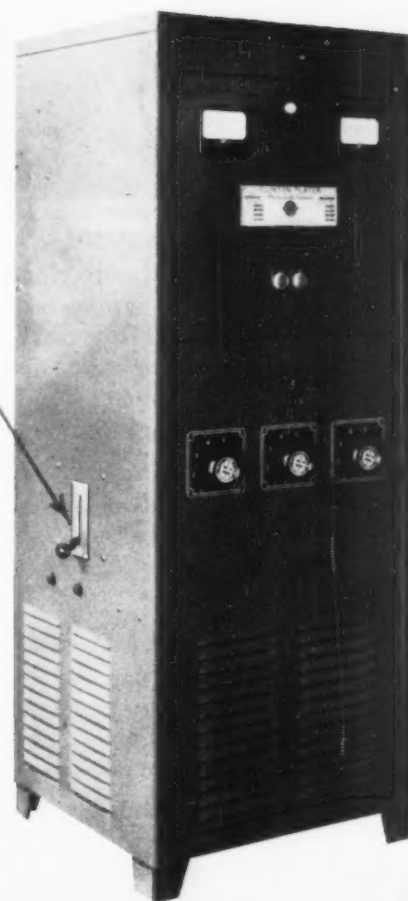
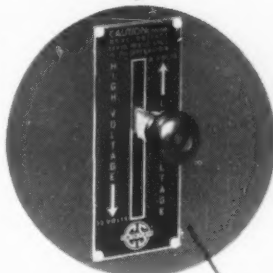
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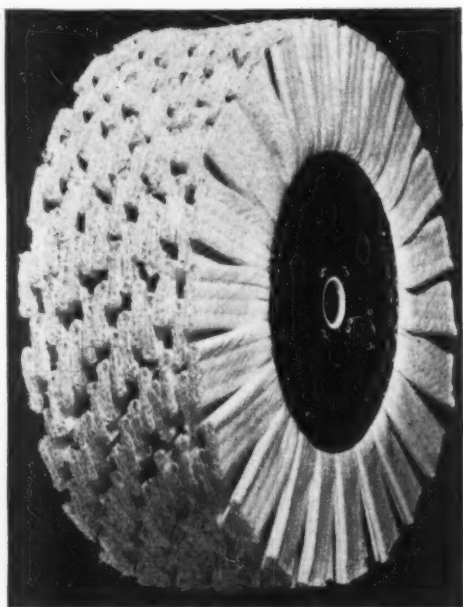


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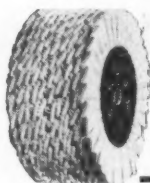
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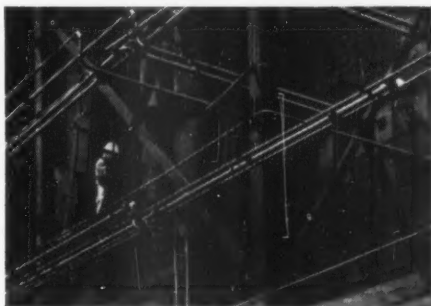
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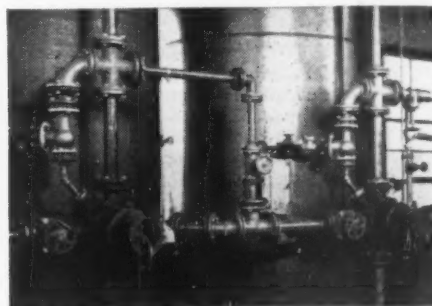
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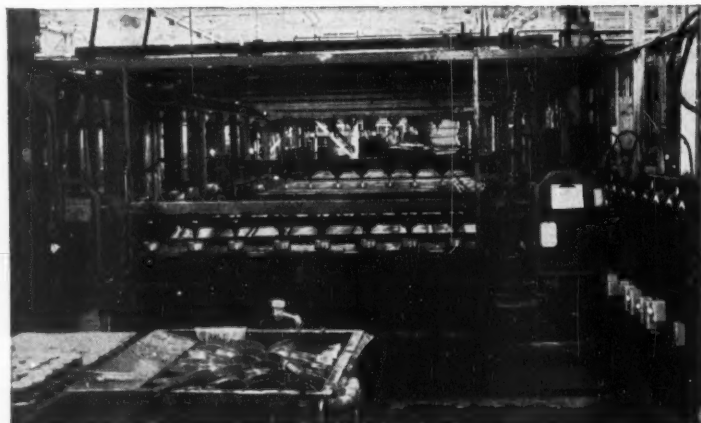


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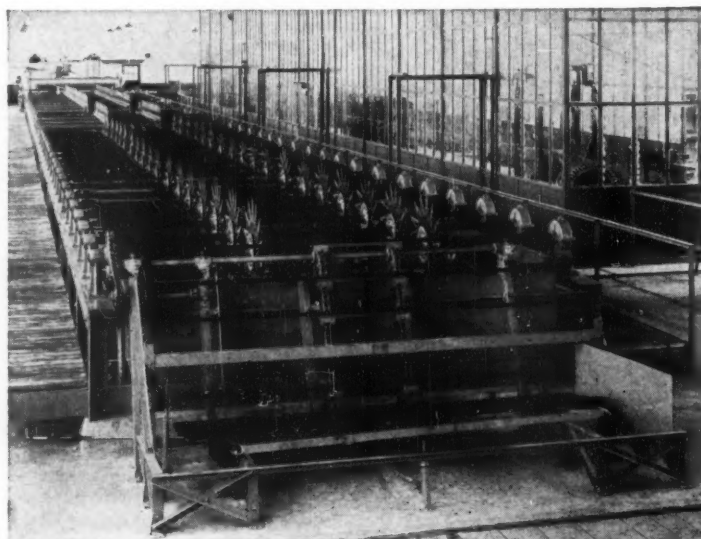
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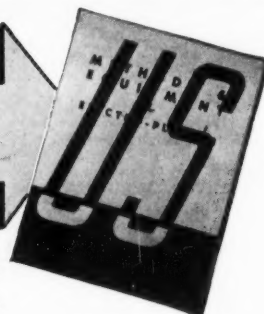
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## FEATURES

Editorial — Take of Good Brass Sheet One Ounce .....	47
Quality Tests for Black Oxide Coatings on Steel .....	48
By Jodie Doss	
Filters — Construction and Operation .....	51
By J. B. Mohler	
The Cr-22 Coating for Magnesium .....	57
By Wm. McNeill	
The Structure of Electrodeposited Metals .....	60
By Rolf Weil and Harold J. Read	
Finishing Pointers — Plating Within Limits .....	65
Science for Electroplaters — Solutions — Equations .....	66
By L. Serota	

## DEPARTMENTS

Shop Problems .....	69	New Books .....	98
Patents .....	73	Business Items .....	98
Abstracts .....	76	Associations and Societies .....	111
Recent Developments .....	80	News from California .....	116
Manufacturers' Literature .....	94	Annual Index .....	118

Equipment and Supplies Advertised in This Issue ..... 127

Published Monthly By

**Finishing Publications, Inc.**

Established in 1903 as Metal Industry by Palmer H. Langdon 1868-1935.

Also publishers of ORGANIC FINISHING and  
annual GUIDEBOOKS and DIRECTORIES.

381 Broadway, Westwood, N. J.  
Westwood 5-1530

L. H. Langdon, President-Treasurer; Palmer H. Langdon, Publisher; Thomas A. Trumbour, General Manager; Joan T. Wiarda, Sales Manager; Nathaniel Hall, Technical Editor; Fred A. Herr, Pacific Coast Editor; John E. Trumbour, Equipment & News Editor; Inez Oquendo, Assistant Editor; Elizabeth Meyers, Circulation Manager.

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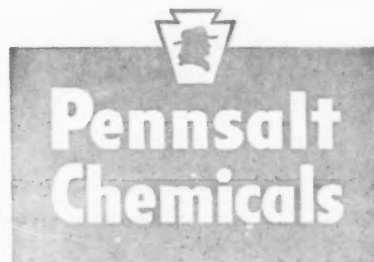
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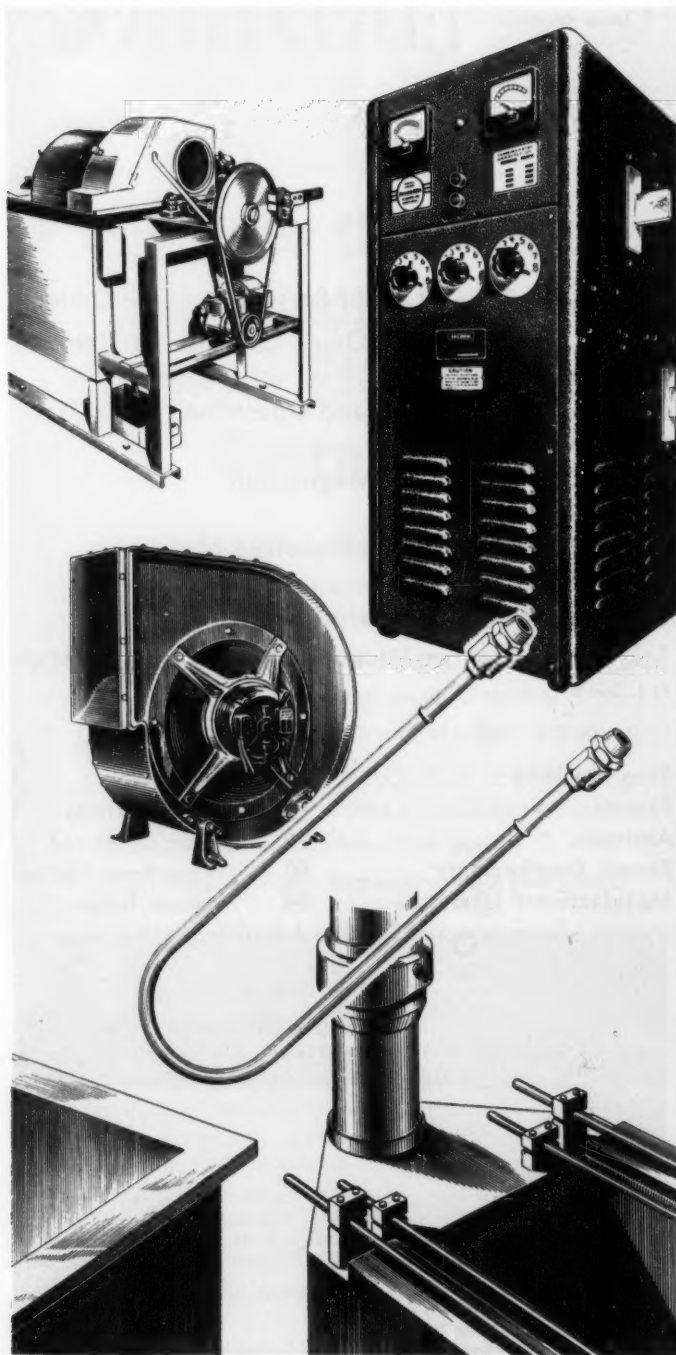
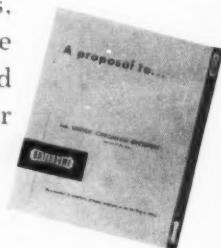
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## Take of Good Brass Sheet One Ounce

Any other month of the year this page would probably be used to register the editor's perpetual dissatisfaction with conditions as they exist in our industry. It appears to be easier to complain than to praise, perhaps because the mistakes and deficiencies are much more obvious to one who feels that progress in our specialty is never sufficiently rapid. However, the festive season is not the time to harp on any shortcomings; it is the time to be joyous and grateful. An excellent way to engender such feelings is to point out how much better off we are, but this particular observer doesn't like his editorial comments to wander from the field of metal finishing. Which brings up the matter of the above heading.

The title of this editorial is the first step in the instructions for preparing a brass solution, which we came across in an old book on the subject. That was the way many plating solutions were prepared at the end of the last century. The next step was to dissolve the metal in nitric acid, followed by precipitation with potassium carbonate. The precipitate was washed carefully, dissolved in ammonia and then treated with sodium cyanide until the blue color disappeared, after which a "moderate" excess was added. Remember, those were the days when the cyanide might have been anywhere from 35 to 75 per cent pure. No wonder plating solutions required aging before they would produce a satisfactory deposit!

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*Nathaniel Hall*

## Metal Finishing

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Happy and Prosperous New Year**



# Quality Tests for Black Oxide Coatings on Steel\*

By Jodie Doss\*\*

## Abstract

**T**HIRTEEN types of steel in accordance with Federal Specification QQ-S-633, compositions FS1020, FS1117, FS1137 and Federal Specification QQ-S-624, compositions FS2330, FC3115, FC4130, FC4340, FC4615, FS6145, FS80B40, FS8690, FS8745 and FS9260 were black oxide treated in an aqueous alkaline oxidizing bath for various periods of time in order to obtain coatings of varying quality. Four different test methods were investigated using these specimens, in order to develop a test which would indicate the quality of black oxide coatings. A test utilizing three drops (0.2 ml) of a five per cent oxalic acid solution on a coated specimen was found to indicate the quality of black oxide coating by the color change of the cov-

ered spot. This test gave positive results for black oxide coatings on all the above steels except on black oxide coatings on the FS9260 steel.

## Introduction

Thin black magnetic oxide coatings ( $\text{Fe}_3\text{O}_4$ ) are formed on steel when treated in a heated aqueous alkaline solution containing an oxidizing agent. These magnetic oxide coatings are believed to be composed of the mixed ferrous and ferric oxides ( $\text{FeO} + \text{Fe}_2\text{O}_3 = \text{Fe}_3\text{O}_4$ ).

The black oxide coatings are very thin and the corrosion resistance without a preservative is poor. They are used primarily for their decorative qualities or as coatings on objects on which a close tolerance must be maintained.

U. S. Army Specification MIL-F-13924 states that the black oxide coating must withstand a one-half hour period of exposure in the salt fog cabinet without evi-

\*The opinions or assertions contained herein are not to be construed as being official or reflecting the views of the Dept. of the Army.

\*\*Ordnance Corps, Metal Finishing Laboratory, Rock Island Arsenal, Rock Island, Illinois.

## OXALIC ACID SPOT TESTS ON BLACK OXIDE COATINGS

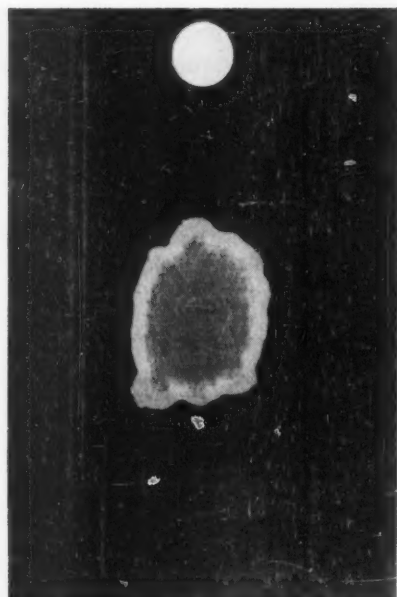


Figure 1. A poor quality coating.



Figure 2. A borderline quality coating.



Figure 3. A good quality coating.

dence of corrosion products. This test involves the use of a costly salt fog cabinet, which is known to be too severe a test for the quality of black oxide coating. The average black oxide coating will fail the one-half hour salt fog test.

This problem was initiated in order to find a simple, inexpensive, more accurate test procedure for determining the quality of black oxide coatings.

### Procedure and Results

Groups of forty-five 2" x 3" x  $\frac{1}{16}$ " Federal Specification QQ-S-633, FS1020 steel panels, which were surface ground on one side and sandblasted on the reverse side, were first degreased in a trichlorethylene vapor degreaser.

The panels were then black oxide treated in production black oxide treating baths of caustic soda-nitrate type. These baths contain approximately 7.5 lbs. per gallon of water of a salt mix consisting of two parts sodium hydroxide, one part sodium nitrate, and a small amount of sodium cyanide (for complexing foreign metals present in the bath).

Two baths are used for the black oxide process and are maintained at the temperature of their boiling points or 290°F. and 305°F., respectively. The boiling points are dependent upon the concentration of these baths. Therefore, the bath operated at 305°F. is a more concentrated bath than the bath operated at 290°F.

The general procedure used in the two bath treatment for blackening steel is to allow the work to remain in the bath operated at 290°F. for one-half hour, cold water rinsed, followed by another half hour treatment in the bath operated at 305°F., cold water rinsed, hot water rinsed, chromic or chromic-phosphoric acid rinsed, and air blown until dry. The black oxide coated objects are then covered with a solvent cut-back petrolatum preservative, Specification MIL-C-16173, Class 3.

The processing of the test specimens for this problem was modified in order to obtain black oxide coatings of varying quality. One-third of the test panels for this problem were processed for only fifteen minutes in the bath maintained at 290°F., cold water rinsed, hot water rinsed, and air blown until dry. Another third of the test specimens were processed for fifteen minutes in the solution operated at 290°F., cold water rinsed, and processed fifteen minutes in the solution maintained at 305°F. The test panels were then cold water rinsed, hot water rinsed and air blown until dry. The latter third of the test panels were processed according to the general shop practice for blackening objects; one-half hour treatment in each of the two tanks.

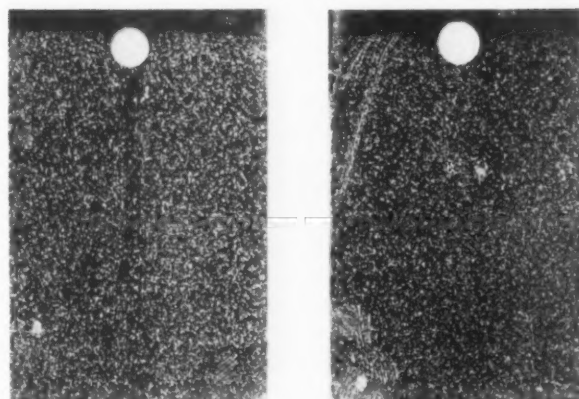
The test panels were not covered with a preservative, as is the usual practice for black oxide coated objects. The black oxide coated test specimens were returned to the laboratory to be used as test specimens.

Three test procedures were investigated using the test specimens above before finding a suitable one using an oxalic acid solution. A brief description of the three test procedures and results are as follows:

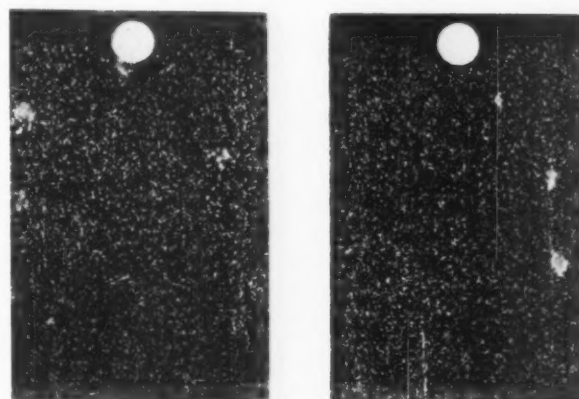
#### IMBIBITION TEST:

This test procedure involved the use of photographic

Figure 4. Salt spray on black oxide coatings.



A poor quality coating.



A borderline quality coating.



A good quality coating.

paper from which the silver salt had been removed. The paper was cut into strips  $2\frac{1}{2}$ " x  $3\frac{1}{2}$ " and immersed in distilled water for fifteen minutes. After the fifteen minute interval, the wet strips of paper were placed with the gelatin side on the machined surface of three 2" x 3" x  $\frac{1}{16}$ " black oxide coated panels which were processed for the three different lengths of time in one or both of the black oxide baths. After an interval of three minutes, the strips of paper were removed from the panels and inspected for rust spots. This test procedure was also followed using potassium ferrocyanide in the water utilized for soaking the strips of photographic paper. This gave the rust spots a blue ferric ferrocyanide color which was more easily visible to the eye.

The photographic paper in contact with the under-

treated black oxide coating, in most instances, exhibited a large number of rust spots that had resulted from contact with the black oxide surface. The paper in contact with oxide coating considered borderline (good-poor), in most instances, exhibited fewer rust spots than did the photographic paper from the considered poor oxide coatings. The paper in contact with the oxide coating considered good, in most instances, exhibited only a small number of rust spots over the area that was exposed to the black oxide surface. During some of the tests the magnitude and degree of the rust spots on the three test panels were of the same order. Therefore, this test procedure was not thought to be discerning or reliable enough for a test of the quality of black oxide coatings.

#### HUMIDITY CABINET TEST:

Groups of the three panel series, previously processed for the three lengths of time in the black oxide baths, were placed in a humidity cabinet with the machined side up. The humidity cabinet was operated at a temperature of 120°F. and a humidity of 95-100%. The panels were inspected every fifteen minutes for rust spots. After forty-five minutes, all the black oxide coated panels exhibited rust spots of the same degree and order. There was no varying degree of corrosion between the three different qualities of black oxide coatings.

#### CITRATE TEST:

Solutions of 1, 2, 3, 5, 10 and 25% citric acid and ammonium citrate were prepared for use as a spot reagent on black oxide coatings.

A drop of the 25% ammonium citrate solution reacted with the poor quality oxide coating, removing the coating after a time interval of one hour. No reaction was noticed on the borderline (good-poor), or good quality coatings. There was no reaction between the more dilute solutions and the black oxide coating.

Drops of the 10 and 25% citric acid solutions on the black oxide coatings gave better results. Generally, the citric acid solutions reacted with the poor and borderline coatings (good-poor), removing the coating within thirty minutes. Generally, there was no reaction between the good quality coating and the citric acid drop. The disadvantages of this spot test were that during some of the tests no reaction was observed between the borderline quality coating (good-poor) and the drop of citric acid solution for one hour, or else no reaction occurred before the evaporation of the liquid, or a few of the good quality coatings reacted with the citric acid solution.

#### OXALIC ACID TEST:

A spot test using an oxalic acid solution on black oxide coating was the next test procedure investigated. Solutions of 1, 2, 3, 5 and 10% oxalic acid were prepared for this spot test. This test procedure involved the placing of three drops (0.2 ml.) of the above solutions upon the black oxide coated surface ground sides of the panels, each of which had previously been processed for three different lengths of time in the black oxide baths.

The color and length of time required for an instantaneous change in the color of the coating or the drop of solution in contact with the black oxide coating was noted and recorded. It was found that there was a color change from black to light grey of the coated spot of the poor quality coating under the drop of oxalic acid in 30 to 90 seconds. This change is shown in Figure 1. The covered spot on the borderline quality coating (good-poor) changed instantly from the original black to a charcoal grey color in one to three minutes and is shown in Figure 2. The drops applied to the coating on the good coating changed instantly from clear to a black or brownish black in three to eight minutes and is shown in Figure 3. The results of a one-half hour salt fog test on duplicate panels are shown in Figure 4. The three and five per cent oxalic acid solutions gave the most reproducible results.

The above test procedure was found to be accurate and reproducible on FS1020 steel and therefore the method was applied to other steels that are black oxide coated. FS1117, 1137, 2330, 3115, 4130, 4340, 5615, 6145, 80B40, 8690, 8745, and 9260 steel pieces were surface ground and black oxide coated for one hour in the two black oxide coating baths. All except the FS9260 steel gave color tests indicating good quality black oxide coatings.

The above tests were performed on the oxide coated surface ground steel specimens. The same tests were repeated on the black oxide coated sandblasted side of the FS1020 steel test specimens, which were processed for the three different lengths of time. The color of the test spots were not the same as for the surface ground side of the panels. The color of the spots on the sandblasted side was slightly darker than the spots on the reverse or machined side of the test panels.

#### Discussion

For the processing of the test specimens, a method had to be devised to obtain black oxide coatings of different qualities. The only practical method was to insure that the black oxide tanks were in proper operating condition and then vary the treatment time. This method is known to produce coatings of different thickness, color, and texture. This was substantiated by the results of the oxalic acid spot test which invariably differentiated between the various treatment periods.

The preliminary test procedure involving either the inhibition, citric acid, or humidity tests were rejected either because there was no variation in the degree of corrosion between the good and poor quality coatings or the results were not reproducible.

The 5% oxalic acid spot test is a simple, inexpensive, and reliable test procedure which may be used to determine the quality of black oxide coatings. The basis of this test is the color change of the oxalic acid spot. The color of the spot formed in the test is presumably the result of removing all the black oxide coating in contact with the oxalic acid solution in the case of the poor quality coatings. Only a partial removal of the coating occurs in the borderline coated

*(Concluded on page 56)*



# Filters -- Construction and Operation

By J. B. Mohler, Consultant, New Castle, Pa.

THE quality of electrodeposits has been steadily increased through the years and the availability of filtering equipment that keeps pace with the quality demand has contributed to this advance. High plating rates, bright plating, and continuous control are all dependent on keeping the bath clean. Filtration merely consists of passing a solution through a porous medium with pores smaller than the size of the material to be removed.

## Gravity Filters

A round piece of filter paper, a funnel and a beaker are commonly used in the laboratory to clarify solutions by this simple process. The common laboratory method depends on gravity to force the solution through the filter paper. The components of this basic process are shown in Figure 1. The filter medium is the porous paper through which the solution flows, and separates the unfiltered material in the funnel from the filtered solution in the beaker.

This method may be used for very small plating baths, especially gold and rhodium solutions, or for filtering small portions of a plating bath. Quantities of one pint to one gallon per hour may be filtered depending on the size and the porosity of the filter paper. In addition to many miscellaneous laboratory applications, this method may be used as an indication of the need for filtration and the type of paper required.

The need for filtration can be determined by plating



Figure 1. Common laboratory method for gravity filtering of small volumes of solution.



Figure 2. Common laboratory method for vacuum filtering of large volumes of solution.

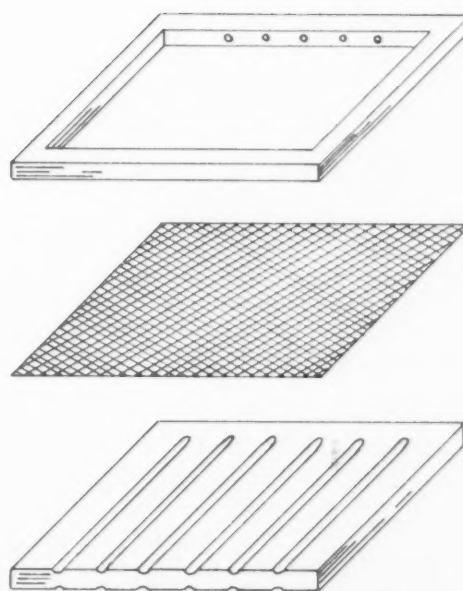


Figure 3. Basic elements of a plate and frame filter press consisting of a filter medium support, a filter medium and space for collection of material removed.

tests before and after filtering. Also, the need for treatment with activated carbon can be determined by this method. If 10 grams per liter of activated carbon are added to a small portion of a bath and agitated for ten minutes, a plating test on the filtered solution will reveal the results of such treatment.

The effect of various grades of filter paper can also be determined by this test. Coarse filter paper results in rapid filtration, removal of large particles, and passing of colloids through the filter medium. By the use of such paper most of the foreign material is removed from the bath without the loss of addition agent effect that is due to colloidal substances. In some cases this may be adequate. The advantage, of course, is the high filtering rate which means less frequent changing of papers or a smaller filter.

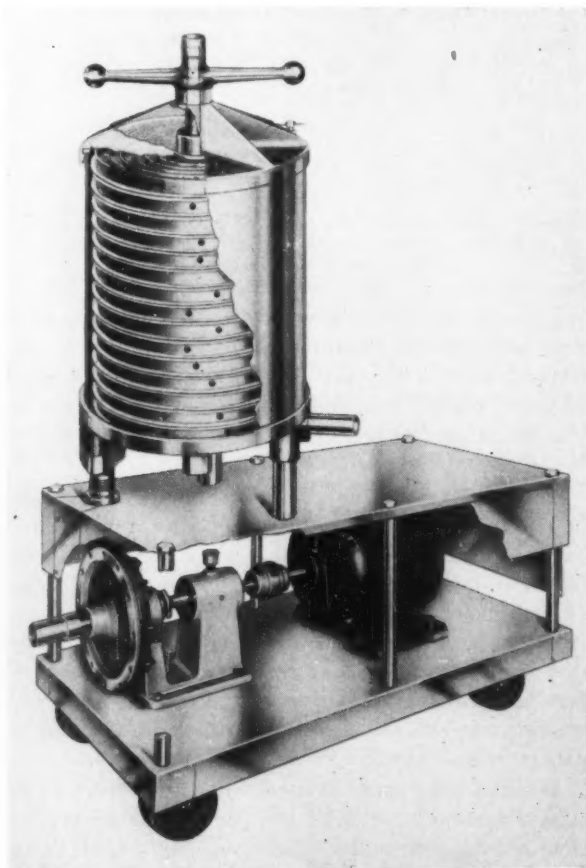
If a fine filter paper is used, some but not all of the colloidal material will be removed. In some applications finer papers will be required, resulting in slower filtering rates, more frequent changing of the filter medium, and more frequent addition of colloidal substances to maintain addition agent effects.

### Vacuum Filtration

In order to force the solution through the filter medium at higher filtering rates, an increased pressure drop across the medium is required. This is commonly done on a laboratory scale by the use of Buchner funnel and a filter flask, as shown in Figure 2. This method may be used for filtering small baths at rates of one to five gallons per hour. However, it is essentially a laboratory method used for faster filtering rates or for filtering larger volumes. It is particularly useful where finer filter papers are used. Also, it is useful where larger amounts of material are to be removed, in that quite a heavy filter "cake" can be built up on the paper. Larger amounts of material are removed for testing purposes where chemicals are precipitated or crystallized from a bath or where experiments are performed with filter aids or activated carbon.

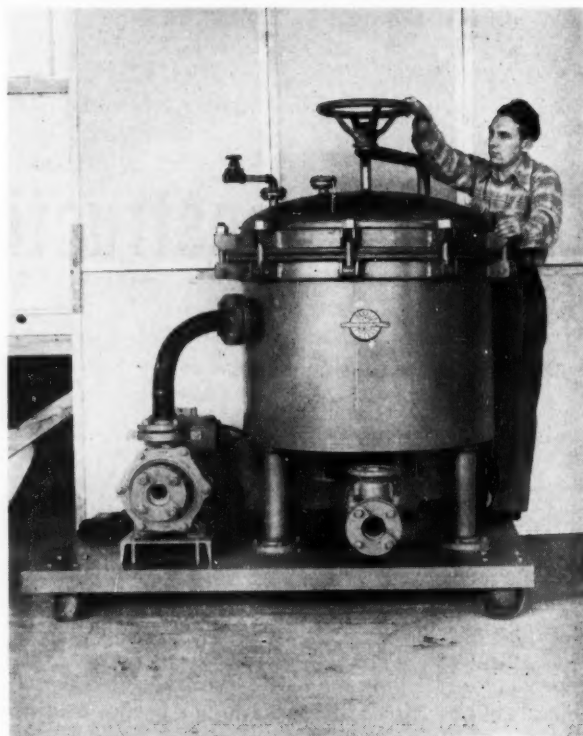
The funnel contains a false bottom that acts as a support for the filter medium and contains many holes to facilitate passage of the solution into the receiving vessel. This principle is common to all of the commercial filters. Large ceramic vacuum filters are available for batch filtration at rates of 5 to 25 gallons per hour.

One manufacturer is offering a vacuum filter specifically for the plating trade (Figure 13). In this unit the solution is syphoned from the plating tank to a filter chamber. The plating solution is sucked through a specially constructed filter leaf and pumped through a return hose to the plating tank. The advantage of this



(Courtesy Alsop Engineering Corp.)

Figure 4. Enclosed portable pressure filter containing a stack of circular filter elements.



(Courtesy Sparkler Mfg. Co.)

Figure 5. Large portable plate filter for filtering of bright nickel and acid copper solutions.

system is that the leaf is easily removable for cleaning. For larger capacities, multiple leaves are employed in the same truck.

### Pressure Filters

In order to filter at higher rates, pressure is applied to the filtering chamber by means of a pump. There is really no limit to the filtering rate when pressure and a pump are used. It is merely a matter of the capacity of the pump and the area of the filtering medium. Pressure filters, therefore, are almost universally specified for plant filtration requirements.

#### THE FILTER PRESS:

A large filtering area can be packed into a small space by assembling a number of filtering cells. The elements for one cell are shown in Figure 3. This is a cell for a plate-and-frame press used in chemical industry, consisting of a frame for receiving the solution to be filtered, a filter cloth and a channeled plate for collection and drainage of the filtrate. Any number of these cells can be successively placed side by side to obtain a large filtering area.

The filters are popular in chemical industry where the solid material is the end product and the filtrate is of less importance. The filter cake can completely fill the frame and, by proper piping and manipulation, it can be washed and blown with air to remove excess solution.

#### ENCLOSED FILTER:

Where primary interest is in the solution, an enclosed system is used so that the filtrate may be piped where desired by pressure. The enclosed, assembled filter consists of a stack of alternate filter medium supports, filter media and spacers to receive the dirty solu-

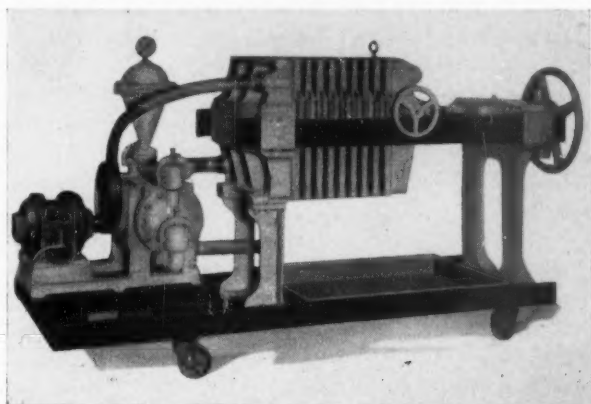
tion. A definite number of cells are assembled in each filter, but filters are manufactured to hold a few or a considerable number of cells. The greater the number of cells, the greater the filtering area and the longer the filter may be operated without changing the filter pads.

A cutaway view of an enclosed pressure filter consisting of a stack of filter elements is illustrated in Figure 4. In this particular filter the dirty solution is pumped into the filter body where it passes into the metal rings that act as spacers for the filter discs. The metal rings, or sludge rings, provide space for sludge or any solids added to or present in the bath and also act to seal the filter discs so that all solution will pass through them. The filter discs consists of paper or of asbestos fibers formed into a graded filtering mat. The filter disc is backed up by a perforated metal disc acting as a filter medium support and containing holes for the passage of the clean solution to the center perforated metal cylinder and thus to the filter outlet.

Filters of this type can be supplied with a few or a great many filter pads. Also pads of various diameters are available so that a wide range of total filtering capacity can be obtained. The smaller filters are often portable, whereas larger units are stationary.

A filter consisting of a vertical filter body and using horizontal plates to obtain a capacity of 3500 gallons per hour is shown in Figure 5. Although many materials of construction are available, the filter shown has a rubber lined body or tank, composition plates with plastic screen and 316 stainless steel compression rings and tie rods. The filtering area is 60 square feet and the filter has a solids capacity of 110 pounds, based on filter aid at 20 pounds per cubic foot. A silicon-iron pump and 3 horsepower electric motor complete this unit recommended for filtering bright nickel and acid copper plating solutions.

Plate and frame presses, as shown in Figure 6, are manufactured for the plating industry. Although these filters do not have an enclosing body they are constructed so that the solution can be continuously pumped through the filter. With this construction it is easy to add extra plates or to substitute thicker plates for greater solids capacity. The filtering medium may consist of metal screens, cloth, filter paper on cloth or filter aids. Cloth filtering media may be washed and reused when they become sufficiently plugged to substantially reduce the filtering rate.



(Courtesy T. Shriver & Co.)

Figure 6. Portable plate and frame type filter with constant volume diaphragm pump and semi-hard rubber plates and frames.



Figure 7. Enclosed filter with filter medium support integral with head of filter.

Another type of enclosed filter is shown in Figure 7. This might be referred to as an integral filter as compared to a stack filter. In the case shown, the filter medium support is integral with the head of the filter. This results in ease of assembly and disassembly. The support may be a single element or it may consist of multiple elements. The support may be covered with a filter medium or it may function as a filter medium. As a support it may consist of perforated stainless steel whereas, if it also functions as a filter medium, it will consist of porous stone, or porous carbon.

A filter with an integral filtering element in the head and a slurry tank is shown in Figure 8. The slurry tank is used for precoat formation with diatomaceous earth, cellulose flock or activated carbon. The filter element may be stainless steel wire or porous stone. Filter elements are available in a single annular-cylindrical shape or as multiple leaves. Cloth bags are used as a filter medium over the supporting filter element. These filters are available with filtering areas of  $\frac{1}{2}$  to 175 square feet and capacities of 250 to 18,000 gallons per hour. The filter is easily disassembled, since functional parts are integral with the head.

Pressure filters may be operated in any position. An example of a horizontal filter with an integral multiple leaf filtering element is shown in Figure 9. Small filters of this type are opened with a hand crank whereas larger units are quickly opened by hydraulic means. The filter leaves are available in several shapes and may be lifted out if desired. The wire leaves are available in steel, stainless steel, bronze and coated steel. Filter bags are available in metal cloth, cotton, wool, paper, Nylon, Vinyon and Orlon.

#### THE CARTRIDGE FILTER:

These filters are manufactured to receive tubular yarn wound cartridges, or porous stone, carbon, and wire mesh cylinders clamped between end plates and enclosed similar to automobile oil filters. The filter element functions both as a support and as a filter medium. One or a number of cartridges may be enclosed with a single filter housing.

A cartridge filter with a disposable filtering medium and a capacity of 100 gallons per hour is shown in Figure 10. The cartridge consists of cotton or plastic yarn wound on an open metal core in such a manner that the inner layers are finely spaced and the outer-layers are more coarse. Filter bodies are available in iron, stainless steel, rubber-lined steel, and plastic.

Filters are also available with multiple cartridges,



as in Figure 11. This is a 3 tube unit with an epoxy resin body for filtering of all plating solutions with the exception of high chloride nickel, high chloride iron and chromic acid. The filter can be easily changed, has a capacity of 300 to 450 gallons per hour and is provided with a self priming, stainless steel pump with a suction lift of 15 feet. Other models are available using one to six tubes.

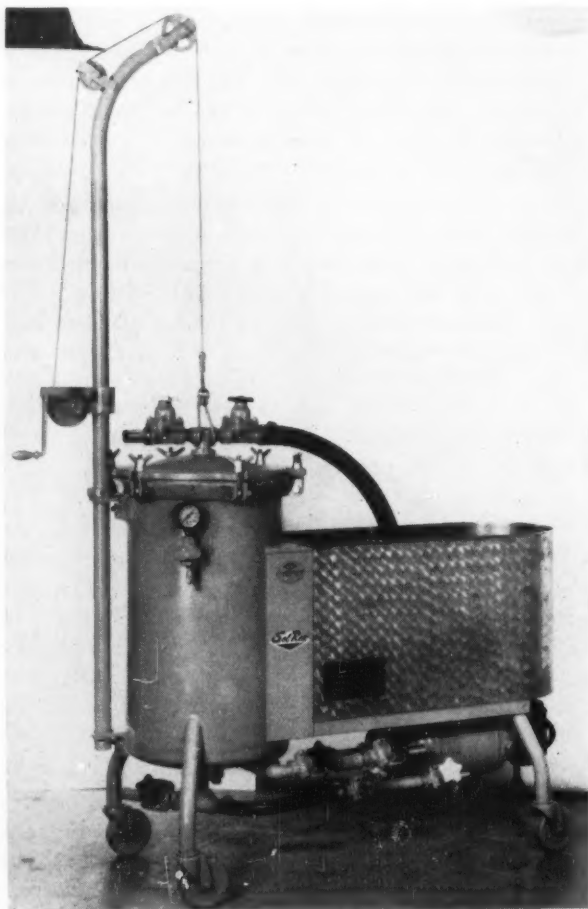
### Filter Capacity

A nominal recommendation for filter capacity is one tank volume per hour. In other words, if the plating tank contains 500 gallons, the capacity should be 500 gallons per hour. In order to determine the actual size of filter to use, the manufacturer should be consulted. The filtering rate is greatly effected by the fineness of the filtering medium. A coarser medium may pass solution at ten times the rate of a fine medium. Also, a fine medium will plug more readily and the filtering rate will decrease rapidly. If a fine medium is required for maximum quality, as for heavy electrodeposits, then a larger filter may be required.

Small cartridge type filters for laboratory, pilot plant, and small scale plating, have a capacity of 50 to 200 gallons per hour.

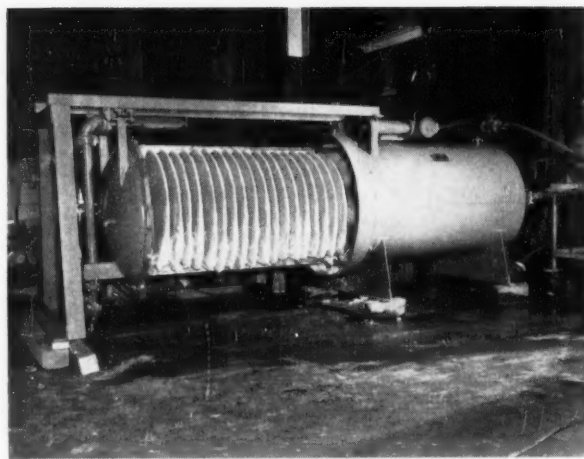
Portable filters, consisting of a filter chamber and assembled with a pump and valves on a dolly for wheeling from tank to tank, have a capacity of 100 to 1000 gallons per hour.

Permanent filters of various types have capacities



(Courtesy Bart-Messing Corp.)

Figure 8. Portable filter with integral filtering element in head of filter and attached slurry tank.



(Courtesy Industrial Filter & Pump Mfg. Co.)

Figure 9. Permanent filter with integral leaves and hydraulic opening means.

in the range of 500 to 15,000 gallons per hour. As multiple installations, greater filtering capacities can be obtained.

### Selection of a Filter

Although all filters may be regarded as *multiple-purpose* filters none are *all-purpose* filters. It is necessary to start with an application, or a number of applications, rather than with a filter.

In addition, factors such as original cost, floor space, maintenance, assembly time, filtering rate, materials of construction, and filtering media must be considered.

#### SPACE WITHIN FILTER:

If a filter is used merely to clarify a solution and the volume of material removed is small, then the space between plates or between the filter support and the housing may be small. Since activated carbon treatment is popular, the space should usually be adequate to handle a relatively large amount of solids. However, if large amounts of compounds, such as carbonates, are to be precipitated from the bath by means of chemical purification, then a large space may be required.

#### MATERIALS OF CONSTRUCTION:

The body of a filter may be constructed of steel, stainless steel, plastic, lead or rubber lined steel. The filter medium support may be constructed of steel, stainless steel, rubber, plastic, ceramic, porous stone, or porous carbon.

For alkaline materials, including the cyanides, steel is satisfactory. Steel will rust, of course, in the presence of water and the absence of alkali, but this is not serious. However, this can be avoided by using stainless steel.

To resist acid solution, heat treated stainless steels or steels, such as type 316 containing molybdenum, are used. The proper stainless steels are resistant to acid concentrations usually encountered in plating baths. Acid baths containing chlorides will attack stainless steels. For the low chloride concentration and low temperatures of the common nickel baths, stainless steel filters are used. Stainless steel has the advantage that it is easily washed free of solution where it is

desired to use the same filter for a number of baths. For continuous operation or more severe conditions, the manufacturer should be consulted.

Plastic and rubber lined steel are relatively inert and are particularly satisfactory where a filter is used for the same types of baths, but operating temperature limitations must be observed.

#### PUMPS:

When a complete filtering unit is manufactured, the pump will be made of a material to resist the plating solutions employed. If supplementary pumps are used and, particularly if used for pumping other solutions, such as strong acids, the corrosion resistance must be considered. Pumps are made of bronze, steel, stainless steel, and high silicon iron. Lead, glass, plastic and rubber linings are also used. Due to higher solution velocities, plus abrasion from small particles, impellers and other parts are more susceptible to corrosion than the filter itself. High silicon iron will resist sulfuric acid pickling solutions and most other acid baths, but the metal is not sufficiently resistant to strong hydrochloric acid.

#### FILTER MEDIA:

Paper, cloth, asbestos, yarn, wire mesh, porous carbon and ceramic plus several filter aids are used as filter media.

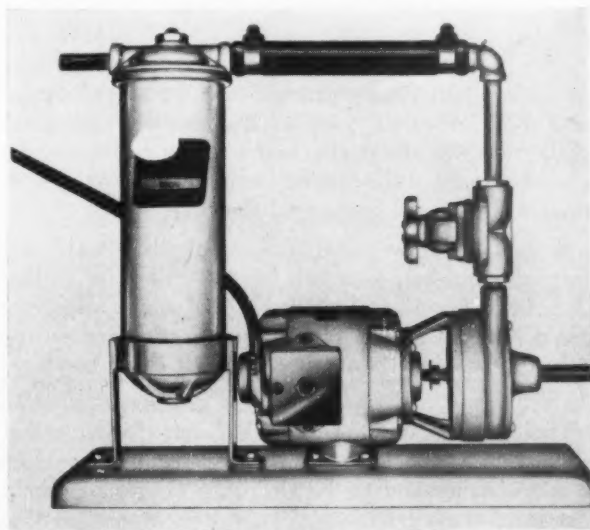
Paper, manufactured to high purity and in controlled porosity grades, is resistant to all of the common plating baths except chromium.

Wound yarn, consisting of cotton, wool, and plastic, are used over integral media supports.

Where a porous media support is used, a filter aid will prolong life of the support by avoiding plugging of the pores. Such filter aids consist of cellulose and asbestos floc and diatomaceous earth.

#### Operation of the Filter

Operation of the filter really depends on the size of the particles to be removed. In general, the particle sizes will be such as to remain in permanent suspension as colloids, to remain in temporary suspension, or to settle readily. Filter media come in as many as eight grades, however we may classify them generally as



(Courtesy Connecticut Metalcraft Inc.)

Figure 10. Small single cartridge type filter



(Courtesy Setheo Mfg. Co.)

Figure 11. Multiple cartridge type filter.

fine, medium and coarse. These do not correspond with the above three classifications for particle sizes. The finest commercial filter will not remove colloidal material from the solution. Colloidal particles in the range of one-millionth of an inch will readily pass through a filter, whereas settling particles in the range of one thousandth of an inch and larger may be readily removed. For practical purposes we may speak of fine, medium and coarse particles as the sizes removed by the three general filter media grades. If fine particles are in suspension in a bath and a coarse filter is used the filter will function for a long time at a high rate but, of course, it will do little good. On the other hand, if a fine filter is used where it is not required it will plug readily. Unfortunately, particles do not come in these three convenient ranges, but rather cover a broad range including fine and coarse. The filter medium required is the one that will be as coarse as possible and still remove all troublesome particles. The finest particles are generally of chemical origin formed by precipitation of compounds, decomposition of chemicals, or polymerization of colloids. Coarser particles may be from dirt in the air, dirt carried in on the work, or anode sludge.

If a bath were never stirred and if particles would settle readily a filter would not be required in many cases. In practice, these conditions cannot be maintained, so it is necessary to keep the bath clean. For settling particles a coarse filter may be used. The particle size is generally smaller than the openings in cloth so that, if cloth is used, a coarse pre-coat may be required. A filter may be selected or piped in such a manner that coarse particles may be removed and the

filter operated without opening the filter. Such a cycle might be operated as follows:

1. Assemble filter with filter media in place.
2. Make a slurry of filter aid in water and pump into filter to form pre-coat.
3. Filter the bath until pressure across filter increases or until the filtering rate decreases.
4. Drain filter.
5. Back wash filter by forcing water through in reverse direction.
6. Make a slurry and repeat cycle.

After a number of cycles it will be necessary to wash the filter cloths to remove filter aid or particles that gradually plug the media.

Cartridges and discs are manufactured essentially to take the place of the filter medium and the filter aid. Outer layers catch coarse particles and inner layers are successively finer, so that each layer will have a capacity to hold back a range of particle sizes and pass the finer particles to the next layer. Such filter media are easily replaced and the filter can be readily cleaned in case it is used for filtering a number of different types of baths where it is important to avoid contamination of one bath with another.

For a new application it is advisable to purchase several grades of filter media to determine the coarsest filter that will clean the bath to satisfaction. Also, it may be found that it is economical to use a coarse filter for continuous filtering and a fine filter for occasional filtering and purification. The final choice is often established by experience, since the requirements are more dependent on the thickness of the deposit, quality required, agitation of the bath and incidence of dirt, than on the specific bath formula.

### The Complete Filtering Unit

Small and medium size filters generally consist of a filter and a pump. Large filters may also be provided with a tank for priming the pump, introduction of filter aid or activated carbon, and draining of solution from the housing.

A filter is really a part of the purification system for a plating bath. On small scale installations it may be regarded as a specific piece of equipment. On a large scale it may be integrated with other purifying

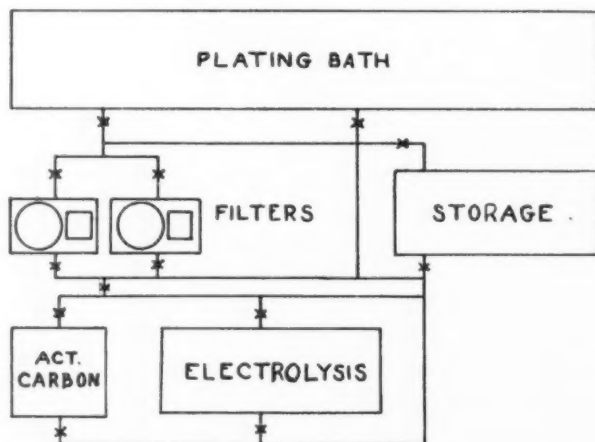
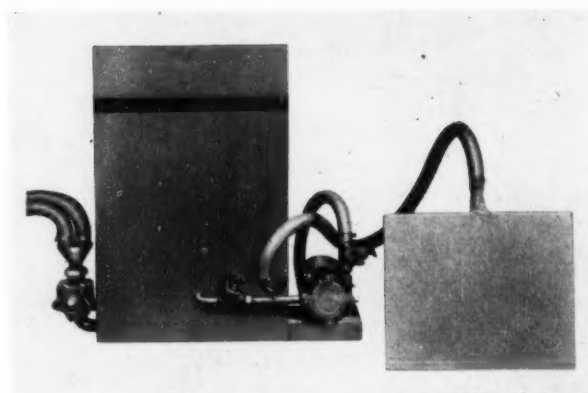


Figure 12. Installation of multiple permanent filters for continuous treatment of a plating bath.



(Courtesy Lea-Ronal Inc.)

Figure 13. Vacuum filter for large volume treatment.

steps, as shown in Figure 12. Such purification equipment is often necessary to keep a large plating bath in continuous production. The bath may be filtered continuously and portions of it may be treated for purification to hold the quality limits, as determined by analyses and plating tests. By using two filters, one may be kept in operation continuously. Activated carbon treatment and low current density electrolysis may be incorporated into the purification system by suitable piping. A storage tank is also provided so that sufficient solution will be available to keep the system in operation and maintain the plating bath level.

### Approximate Filtering Rates for Various Types of Equipment

Equipment	Filtering Rate Gallons per Hour
Glass funnel and filter paper	$\frac{1}{8}$ to 1
Buchner funnel	1 to 5
Ceramic vacuum filter	5 to 25
Small cartridge filter	50 to 200
Portable pressure filter	100 to 1,000
Permanent filter	500 to 15,000

### QUALITY TESTS FOR BLACK OXIDE COATINGS ON STEEL

(Concluded from page 50)

(good-poor) specimen areas giving the oxalic acid covered spot a charcoal grey appearance. For the good quality coating, the oxalic acid solution removes only a small amount of the coating but not enough to exhibit areas with exposed base metal showing.

It should now be possible to completely discard the unreliable one-half hour salt fog test called for in the U. S. Army Specification MIL-F-13924 and incorporate this new spot test in a revised specification for accurately determining the quality of black oxide coatings on steel.

The author wishes to express his appreciation to his co-workers at the Rock Island Arsenal Laboratory for their assistance and to the Ordnance Corps, Research and Development Division of the Department of the Army and the Supervisory Staff of the Laboratory for permission to publish the information in this paper.



# The Cr-22 Coating for Magnesium

By Wm. McNeill, Pitman-Dunn Laboratories, Frankford Arsenal, Philadelphia, Pa.

THE newest of the anodic coatings for magnesium is the Cr-22 coating which was developed at Frankford Arsenal. This coating combines short treatment times and low electrolyte costs with excellent protective properties. The coating, which is non-alkaline, can be used as a base for organic finishes or can be used as a final finish with or without an optional inorganic seal. The coating is far smoother than any of the high voltage anodic coatings which are used for magnesium at the present time.

## Bath Composition

Chromic acid .....	25 g./l.
50% Hydrofluoric acid .....	25 m./l.
85% phosphoric acid .....	50 "
Ammonia .....	160-180 "

Ammonium salts can be used provided they contain no alkali metal ions. The bath may be placed in a steel tank which should be equipped with steel coils for steam heating.

Addition of an extra 10 ml./l. of HF produces smoother coatings and somewhat lighter color but has no marked effect otherwise. Such additions are entirely optional and may be made at the discretion of the operator. The added HF should be neutralized by the addition of an equivalent quantity of  $\text{NH}_4\text{OH}$ .

## Operating Procedure

Alternating current of 60 cps. is used. Equal areas of magnesium are connected to each bath terminal and current density is calculated as the total bath current divided by the total area of magnesium surface in the bath. The recommended current density is 15 amp./ft.<sup>2</sup> but wide variations are possible.

The bath is operated at 95°C. for best results although coatings can be obtained at as low as 25°C. Coatings of good quality can be produced throughout the range from 75°C. to 95°C. with thickness increasing as temperature is raised. Operation at the lower values simplifies the problems of vapor control and

temperature maintenance and anyone applying the Cr-22 coating should feel free to use the operating conditions which best suit his purpose.

Electric power is supplied from a variable voltage source capable of delivering the required current over a range of from 0 to 380 volts. Either the power supply or the bath must be isolated from ground.

The coating process is considered complete when the voltage reaches 320, but thicker coatings can be obtained by continuing treatment to higher voltages. Between 320 and the 350 volts the thicker coatings are apt to be non-uniform, due to the incomplete formation of a heavy deposit. At about 380 volts the heavy deposit becomes uniform. Treatment time is dependent on current density, temperature, final voltage, and bath composition but should be about 12 min. using the composition and conditions given above.

Agitation can be used with this bath but is primarily a means of maintaining uniform temperature.

## Preparation and Racking of Work

Grease and paint should be removed from all parts that are to be treated. This can be carried out by any of the usual means. Sandblasting should be avoided as it contaminates the magnesium with iron and silica.

Acid pickling is recommended where appearance of the coated part is important. Deep scratches, or highly worked areas on the magnesium surface can lead to darker colored areas in the coating, but this does not appear to affect corrosion resistance.

Acid pickles that have been used successfully are:

Nitric acid .....	8% (volume)
Sulfuric acid .....	2% (volume)

and

Chromic acid .....	24 oz./gal.
Ammonium nitrate .....	4 "

Both pickles are used at room temperature.

Parts to be coated are suspended in the tank by means of magnesium racks which must make a tight

contact with the work and should be protected at the solution level with insulating tape. It is important that neither the racks nor the work contain foreign metal inserts such as steel rivets or bolts, since these will prevent coating formation. The coating can be applied to parts containing aluminum rivets, but this is not a recommended practice.

### **Sealing the Coating**

Coated parts can be sealed in a sodium silicate solution whose composition is 10% by volume 40-42° Bé sodium silicate solution.

This bath is operated at from 85°C. to boiling, and coated parts are dipped in it for 2 minutes, then dried without rinsing. The sealing treatment greatly increases the corrosion resistance of coated parts and is recommended for coated parts that are to receive no organic finish.

### **Control of Operational Difficulties**

#### **BATH DEPLETION:**

This will undoubtedly occur in time but has not been studied in detail. Vapor losses are increased as temperature is raised from 75°C. to 95°C. and decreases in fluoride concentration and pH can occur. The bath can be replenished by simply adding fluoride and ammonium ions in whatever form is convenient.

#### **NODULE FORMATION:**

In some cases coatings are produced in which there are tiny cratered nodules. These appear to be caused by small amounts of alkali metal ions in the bath or by contamination in the magnesium or by low fluoride in the bath. The first of these conditions can be eliminated by careful bath makeup and thorough rinsing of parts before they are placed in the bath. The second may occur when materials such as iron are permitted to enter the magnesium. The acid pickles given above are helpful in some cases, but occasionally pickling in 15 to 20% HF is needed. Parts can be Cr-22 treated immediately after the HF dip.

The most important cause of nodule formation appears to be low fluoride concentration. When nodule formation begins to occur, an addition of 10 ml./l. HF (50%) and an equivalent quantity of  $\text{NH}_4\text{OH}$  has been found sufficient to restore the original performance of the bath.

#### **LOW VOLTAGE:**

It occasionally happens in the Cr-22 treating of magnesium parts that no high resistance film forms. The result is that the required current passes at low voltage and a film having no protective properties appears. This difficulty, which is not confined to the Cr-22 process, can be overcome by surging the bath current to several times its normal value or by removing the work from the tank and dipping it in 20%  $\text{CrO}_3$  or 15-20% HF (both at room temp.). The work is then replaced in the tank and treated.

### **Performance of the Coating**

#### **CORROSION RESISTANCE:**

4" x 6" FS-1 alloy panels usually show no corrosion

after 48 hours exposure in 20% salt spray. After 120 hours exposure, panels of this size usually average from 1 to 5 pits although, with some lots of this alloy, averages of 7 to 8 pits per panel have been observed. This degree of protection is achieved without the use of post treatments such as are required for other magnesium coatings.

Panels which are silicate sealed, as described above, exhibit a marked increase in corrosion resistance. 4" x 6" FS-1 alloy panels were coated, sealed, and exposed to salt spray. After 420 hours exposure these panels averaged 4 pits each. Similar panels cut from the same alloy lot were coated but not sealed. These panels averaged 7.4 pits per panel at 120 hours.

#### **GALVANIC CORROSION:**

Treated specimens coupled with 24-ST aluminum and 18-8 stainless steel are not corroded after 5 hours exposure in 20% salt spray. After 24 hours exposure aluminum couples are not corroded, but the coating in contact with steel couples is discolored. No heavy corrosion products were formed.

#### **OUTDOOR EXPOSURE:**

Both galvanic coupled and uncoupled coated specimens were exposed to an industrial atmosphere at Frankford Arsenal for 10 months. Fig. 1 shows the condition of these panels after exposure. Panel A was uncoupled; Panel B was coupled with 24-ST aluminum; Panel C was coupled with 18-8 stainless steel; and Panel D was coupled with copper.

The blemishes, which are generally distributed over all the panels, are caused by air-borne dust and dirt. The same type of markings are on the test racks where the panels were mounted.

The dark rings on Panels B and C are discoloration due to corrosion of the exposed metal disk, but there are no breaks in the coating on either of these panels. Pits appear on Panel D but they are very shallow.

#### **PAINT BASE TESTS:**

Cr-22 coated panels were painted with one coat of zinc chromate primer, scribed, and placed in 20% salt spray. After 1500 hours exposure the specimens were all intact. This test was continued to 5000 hours and at this point the Cr-22 specimens showed almost no undercutting of the paint and only slight pitting.

#### **DIELECTRIC BREAKDOWN:**

500 to 600 volts are normally required to cause breakdown of the coating.

#### **HARDNESS:**

This is difficult to measure, but the coating will abrade copper and mild steel.

#### **APPLICATION TO VARIOUS ALLOYS:**

The coating has been applied successfully to FS, J, C, H, ZK-60, ZRE, Z5Z and M alloys. Application on M alloy can be troublesome, and normally requires high current densities. FS panels having aluminum rivets in them have been coated successfully. This is a useful property since defects in magnesium parts are

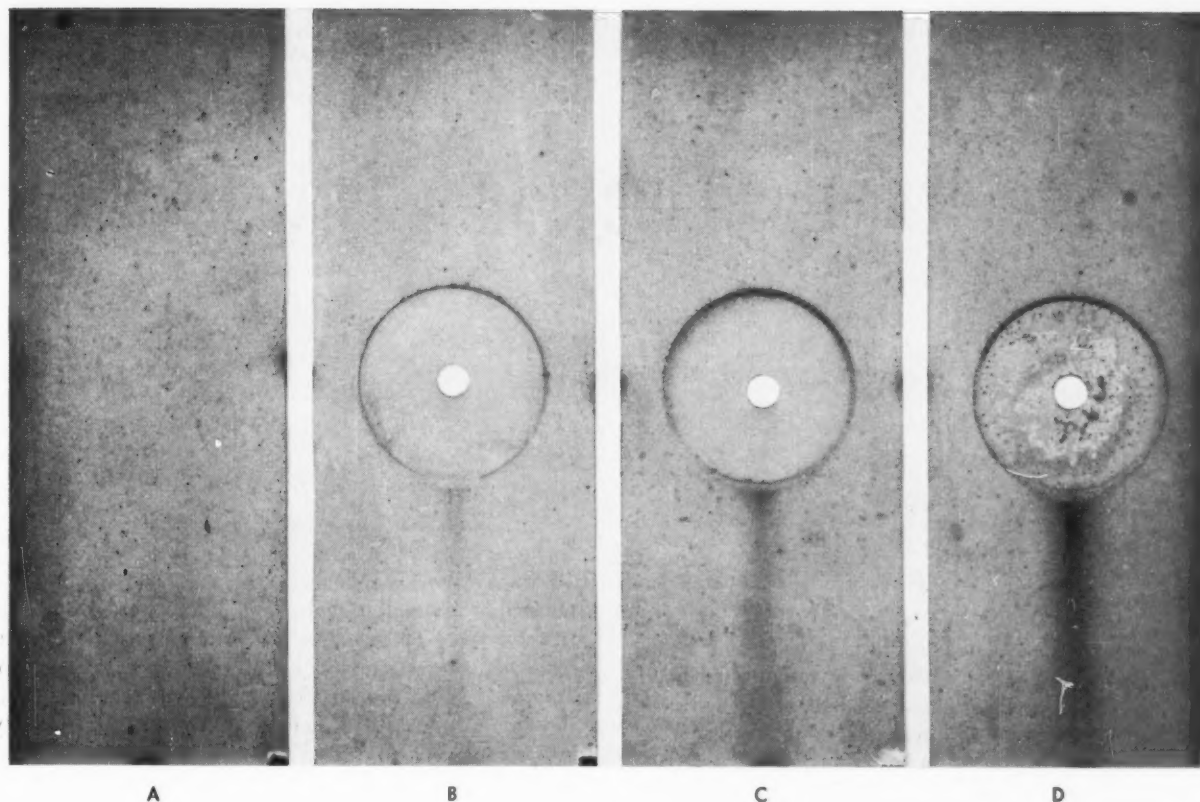


Figure 1.

sometimes filled with aluminum and most coatings cannot be applied when this is the case.

#### ADHESION:

The adhesion of the coating was measured by cementing metal disks to opposite sides of coated panels. 2500 psi was the average force required to separate the coating from the magnesium by pulling normal to the panel surface.

#### THICKNESS AND THICKNESS BUILD-UP:

Thickness varies somewhat with temperature but at 95°C. the coating has a total thickness of about 1 mil and adds approximately 0.75 mil per surface on FS alloy.

#### Coating Appearance

The Cr-22 coating is a fine-grained green material which resembles unglazed ceramic ware in texture. The coating normally exhibits a surface roughness of 80 to 100 microinches rms but this, of course, is increased if the original metal surface is rough. The color of the coating can be deepened through olive drab nearly to black by increasing the chromate concentration of the bath. Increasing fluoride concentration not only causes a slight lightening of the color of the coating but tends to decrease surface roughness to 60 to 70 microinches rms.

Operating conditions also affect the appearance of the coating. The thick coating which is obtained with prolonged treatment is also rougher than that obtained with normal treatment.

Finishes of 200 microinches or higher are obtained at the higher voltage. Short treatment times produce coatings which are smoother and lighter in color than the normal coatings. Undertreatment, of course, decreases the corrosion resistance and dielectric breakdown of the coating.

As temperature is raised the color becomes lighter green.

As current density is raised the color becomes darker green.

It would seem from the numerous variations listed above that coating appearance would be difficult to maintain constant. This has not been true in the pilot scale operations which have been conducted at the arsenal, and comparable coatings can be obtained not only on different occasions with one bath but also with different baths.

Inquiries about the Cr-22 coating should be sent to the attention of the author, Pitman-Dunn Laboratories, Frankford Arsenal, Philadelphia 37, Pa. The author wishes to express his appreciation to the Ordnance Corps for permission to publish this article.





# The Structure of Electrodeposited Metals\*

By Rolf Weil† and Harold J Read‡

This is the second installment of this article. The first part appeared in our November issue.—Ed.

## NICKEL DEPOSITS:

The structures obtained in the all-sulfate and Watts nickel baths bear a very close resemblance to each other, in that all of them belong to type I. The samples examined by electron diffraction show only the face-centered-cubic configuration of nickel. It is also observed that the brightness of the surface of the deposits produced in both baths is the same. The type IA structures give a very spotty diffraction pattern which is a result of a relatively coarse-grained structure. The diffraction pattern thus substantiates the findings obtained by electron microscopy. In the all-sulfate bath, the surfaces of the deposits from the solutions with high pH developed fine-grained structures whereas those from the low pH baths consisted of large, plane areas. Here the theory, widely accepted in the literature, that the formation of basic materials at the higher pH develops more nuclei for grain growth, seems to be substantiated. However, the same theory does not hold

for the Watts bath in which more nuclei seem to have formed at the low pH than at the high pH.

The all-chloride nickel bath is characterized by a seemingly anomalous behavior. Three types of microstructure are obtained by only varying the temperature, pH, and current density. The type IB structure obtained from the all-chloride bath resembles that shown in Fig. 5. The acicular structure has already been shown in Fig. 8. Frequently the needles form colonies, as is evident in Fig. 17. The tendency towards colonization is especially pronounced for thicker deposits; a 2-mil deposit illustrating this is pictured in Fig. 18. The type ID structure, as formed in nickel all-chloride baths, has already been seen in Fig. 7. Mixed structures are shown in Figs. 19 and 20. It is seen that the ratio of needles to regular grains varies with the plating conditions.

The reason for the behavior of the all-chloride bath will be discussed later, but a number of facts which permit the formulation of a hypothesis can be examined now. Obviously the chloride ion has some influence on the structure, as suggested by the observation that, if no chloride ions or only small quantities of



Fig. 17. Electron micrograph showing structure type IIA in colonies, all-chloride nickel bath, 5.0 amp./dm.<sup>2</sup>, pH 4.2, 55°C., ( $8 \times 10^{-4}$  cm. thick). 15,000X.

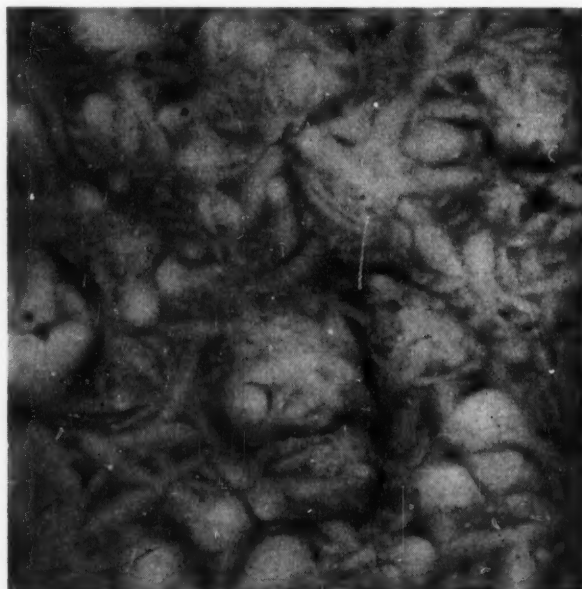


Fig. 18. Electron micrograph showing structure type IIA in colonies, all-chloride nickel bath, 5.0 amp./dm.<sup>2</sup>, pH 4.0, 55°C., ( $6.4 \times 10^{-3}$  cm. thick). 15,000X.



Fig. 19. Electron micrograph showing mixed structure of types IB-4 and IIA-6, all-chloride nickel bath, 5.0 amp./dm.<sup>2</sup>, pH 0.8, 25°C, 15,000X.

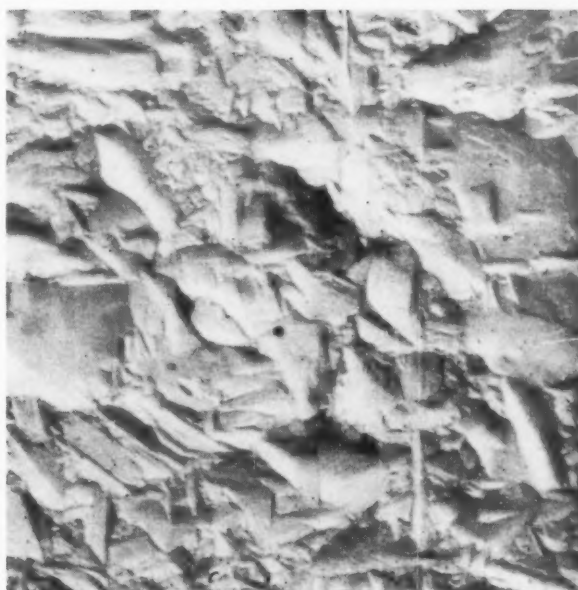


Fig. 20. Electron micrograph showing mixed structure of types IB-5 and IIA-6, all-chloride nickel bath, 5.0 amp./dm.<sup>2</sup>, pH 4.2, 25°C, 15,000X.

them are present in the baths, the type II structure does not occur in nickel. The influence of the chloride ion was further demonstrated by the addition of sodium chloride to the all-sulfate nickel bath. The quantity of salt which was introduced gave a chloride ion concentration equal to that in the all-chloride bath. Under plating conditions of 0.5 amp./dm.<sup>2</sup> (5 amp./ft.<sup>2</sup>), a pH of 4, and room temperature, the all-sulfate bath gives a IB structure and the all-chloride bath an acicular structure. The structure obtained in the solution with sodium chloride was ID, a type obtained in the all-chloride bath at the same current density and pH, but at 55°C. (131°F.).

Sodium sulfate in the all-sulfate bath has no effect on the deposit, thus showing that the chloride ion is responsible for the change of structure with sodium chloride additions. The possibility that impurities, other than those formed by the deposition process, were responsible can be ruled out. The structures obtained from four independently prepared solutions, three of which were purified by different methods, were identical under the same plating conditions. This also shows that the structures are reproducible and not accidental growths.

The dullness of the acicular structure, approaching the appearance of the so-called "burned" deposits, led to the thought that oxides may have codeposited with the nickel. Inasmuch as Gardam and Macnaughton<sup>2</sup> found that certain annealed deposits contain dark particles which they claimed to be basic compounds, three typical samples were selected for annealing experiments. A type IA deposit from a Watts nickel bath, a type IB deposit from an all-chloride nickel bath, and a type IIA deposit from the same all-chloride nickel bath were annealed at 900°C. (1652°F.) for two hours, after a thick deposit of Watts-bath nickel had been applied to the three samples simultaneously to protect them from oxidation. The cross-sections of the three deposits were examined microscopically.

The annealed specimen, which formerly had an aci-

cular structure, was found to contain some foreign particles which glowed under polarized light. Evidences of high stresses, which are usually present in all-chloride deposits, could also be seen in the structure of the cross-section. The annealed, protective nickel deposits on the all-chloride plates showed twinning, whereas the protective metal on the specimen from the Watts bath showed only slight twinning. As the protective plates were of identical composition and were annealed for the same time and at the same temperature, the twinning can only be the result of stresses which were present in the original samples. The distortion of the copper basis-metal by the all-chloride nickel deposits in a way to indicate a tensile stress had also been observed and confirms these speculations. The samples with the acicular and dome-like (ID) structures always show higher stresses than the type IB all-chloride nickel deposits.

Electron-diffraction studies of the all-chloride nickel deposits indicate that the lattice structure is close-packed hexagonal as well as face-centered cubic. Yang<sup>3</sup> reported that nickel plated from an all-chloride bath under certain plating conditions has a mixed lattice of this sort. He reported the presence in his diffraction patterns of the (10.0) ring of the hexagonal lattice. This ring was also tentatively identified in the patterns of some of the all-chloride deposits prepared in the present investigation. There is some uncertainty of identification owing to the possible appearance of the (200) ring of nickel oxide, which has approximately the same radius as the (10.0) ring of hexagonal nickel.

Uncertainties in the lattice constants of hexagonal nickel make it impossible to determine definitely whether the hexagonal nickel ring or the nickel oxide ring is present. There are some indications, however, that it is the former which is seen in the patterns. Most of the diffraction patterns contain a rather diffuse ring between the rings of the (220) and (200) planes of nickel; this is the (220) ring of nickel oxide. In the patterns which show fibering in the deposits, the in-



Fig. 21. Photomicrograph showing as-plated surface, all-chloride nickel bath, 0.5 amp./dm.<sup>2</sup>, pH 4.2, 25°C.,  $5 \times 10^{-2}$  cm. thick, etched in acetic-nitric acid mixture. 2,000X.

tense portions of the (220) ring of nickel oxide occur in the same places as those in the corresponding nickel ring. However, this is not so in the case of the ring which could be the (200) ring of nickel oxide and its corresponding nickel ring. The (200) ring of nickel is absent in the majority of the all-chloride nickels. The ring under question is also not as diffuse as the (220) ring of nickel oxide. It seems therefore that the (10.0) hexagonal ring is present.

The presence of the (220) ring of nickel oxide in the diffraction patterns is probably due, at least in part, to the oxide film which covers all nickel surfaces handled in air. There is, however, a question whether the oxide film accounts exclusively for the rather strong nickel oxide ring; oxides present in the deposit could also be partly responsible.

Visual observations of the deposits show that the

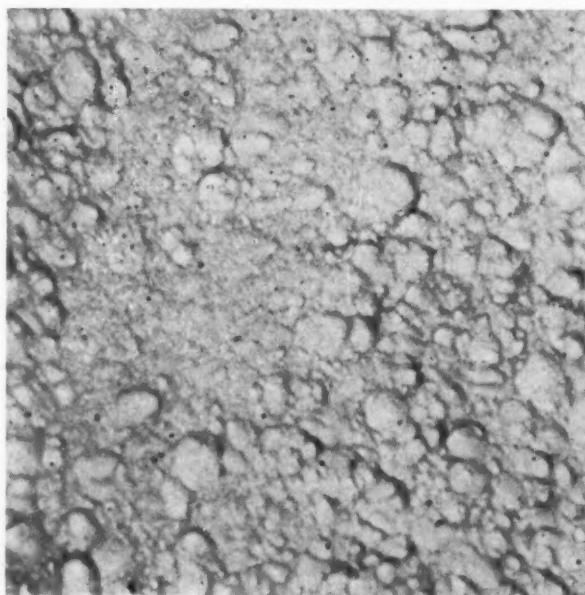


Fig. 22. Electron micrograph showing structure type IA-1, Watts cobalt bath, 5.0 amp./dm.<sup>2</sup>, pH 4.1, 25°C. 15,000X.

all-chloride nickel is not as bright as that from the Watts and all-sulfate baths. The acicular and dome-like structures are always duller than the other structures obtained from the all-chloride bath. The absence of reflecting planes in the surface, or slightly inclined to it, in the acicular and dome-like structures probably accounts for the dullness of the deposits. The platelets present in all class I deposits, except ID, probably can reflect light and, as a number of these platelets are in the plane of the surface, their contribution to the brightness of the deposits can be easily visualized.

The nature of the dome-like ID structure is not clearly understood, but there is some evidence that it related to the acicular structure. It was previously noted that an originally all-sulfate bath to which sodium chloride had been added gives the ID structure under the same conditions that the all-chloride bath yields the acicular type. The additions of some organic brighteners, such as chloral hydrate and naphthalene disulfonic acid, to the all-chloride bath also results in

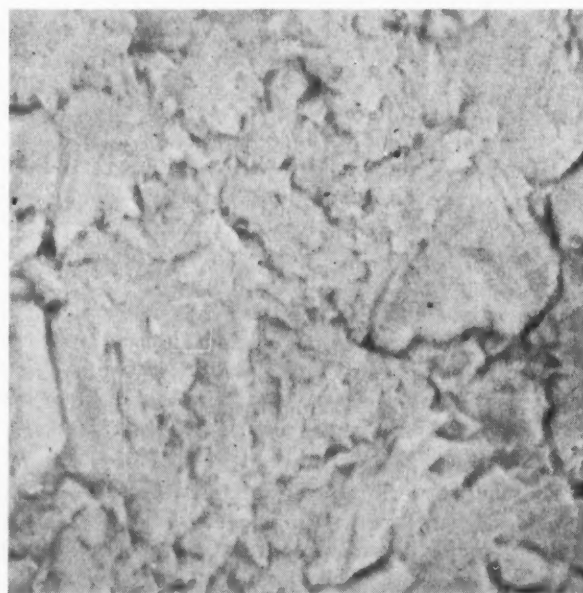


Fig. 23. Electron micrograph showing structure type IB-4, all-chloride cobalt bath, 5.0 amp./dm.<sup>2</sup>, pH 4.1, 55°C., ( $8 \times 10^{-4}$  cm. thick). 15,000X.

the dome-like structure under conditions which otherwise give an acicular structure.

Before passing on to consideration of other deposits, it may be of interest to give a specific example of the superiority of the technique used in this work for the examination of surfaces. The polished and etched surface of an acicular deposit prepared in the usual way for microscopic examination is pictured in Fig. 21. This photograph is like those often found in the literature as representative of the structure of an all-chloride nickel deposit. Knowing the structure of the unetched surface as revealed in Fig. 8, it is easily seen how polishing and etching results in that shown in Fig. 21. However, it is very doubtful if anyone could deduce from Fig. 21 alone that it represents an acicular structure.

#### COBALT DEPOSITS:

The behavior of the three cobalt solutions which



were investigated is similar to that of the nickel all-chloride bath. The structures found in the all-chloride nickel deposits are also present in those of cobalt. The all-sulfate and Watts cobalt solutions behaved similarly, as did the corresponding nickel baths. With only a few minor exceptions, the structures obtained under identical conditions are the same in the two baths. As was the case with nickel baths, the structures of the deposits from all-chloride solutions do not correspond to those obtained under the same plating conditions in the other two baths. However, all types of structures which are observed in the all-chloride deposits can be seen in those prepared under appropriate plating conditions from the other two cobalt solutions.

The type IA structure of cobalt is shown in Fig. 22, and type IB structures are shown in Figs. 3 and 23. The last picture again shows the platelet structure. A mixed structure is shown in Fig. 24. As in nickel, the amounts of acicular and of uniformly granular constituents vary with the plating conditions. An example of the acicular structures obtained in cobalt appears in

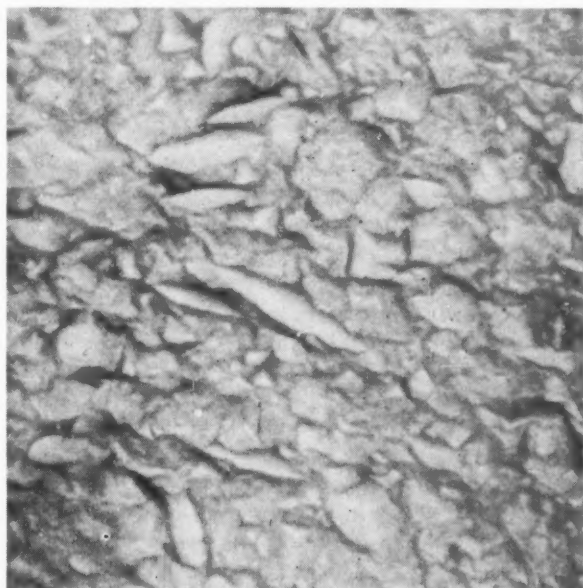


Fig. 24. Electron micrograph showing mixed structure of types IB-5 and IIA-6, Watts cobalt bath, 5.0 amp./dm.<sup>2</sup>, pH 4.1, 55°C. 15,000X.

Fig. 9. Most IB structures found in cobalt are finer than those in nickel; the reverse is true of the acicular type. The needle and dome-like structures of cobalt again result in a duller appearance of the deposit. Some very bright electroplated surfaces were also obtained from cobalt baths. It appears that the fine-grained structures result in bright surfaces, but two exceptions were noted, again showing that grain size alone does not determine brightness. The exceptions occurred in the cobalt all-sulfate bath at 0.5 amp./dm.<sup>2</sup> (5 amp./ft.<sup>2</sup>), pH 4 and 55°C. (131°F.), and in the Watts bath at 0.5 amp./dm.<sup>2</sup> (5 amp./ft.<sup>2</sup>, pH 1 and 25°C. (77°F.).

The electron diffraction studies of cobalt deposits indicate the presence of a mixed lattice. The difficulties of ring identification in the diffraction patterns encountered with nickel were not problems in cobalt because other hexagonal rings, in addition to the (10.0) ring, are usually present. The cobalt oxide rings

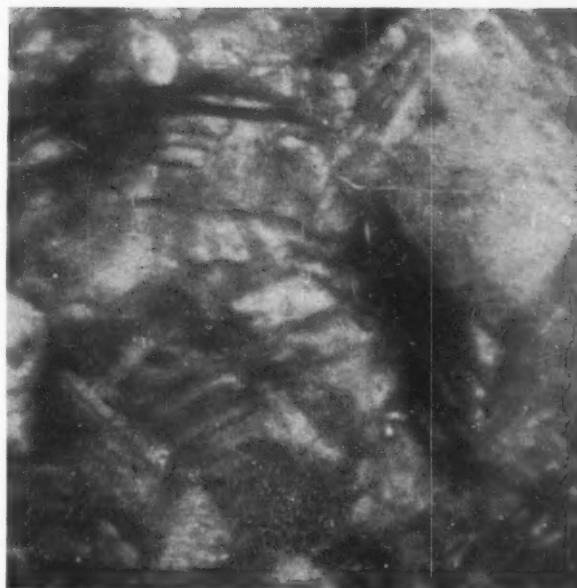


Fig. 25. Electron micrograph showing structure type IC in commercially deposited copper. 15,000X.

are also present in the diffraction patterns; many patterns contain all three of the prominent cobalt oxide rings. A relationship between the intensity of the oxide rings and the pH is indicated, as specimens from the low-pH Watts and from all-sulfate solutions have less intense rings than those deposited at the higher pH or in the all-chloride bath. One plate from the low-pH all-sulfate solution does not show any oxide rings. However, before any definite conclusions can be drawn, a larger number of specimens should be tested.

#### COPPER DEPOSITS:

The two baths which were employed for the deposition of copper differ considerably from the nickel and cobalt solutions. The acid copper bath, although it is also an all-sulfate bath, has a much lower pH than that used in nickel and cobalt solutions. The efficiencies in the acid copper solution with the plating conditions used in this investigation are also higher than



Fig. 26. Electron micrograph showing structure type IC in electropolished commercially deposited copper. 15,000X.

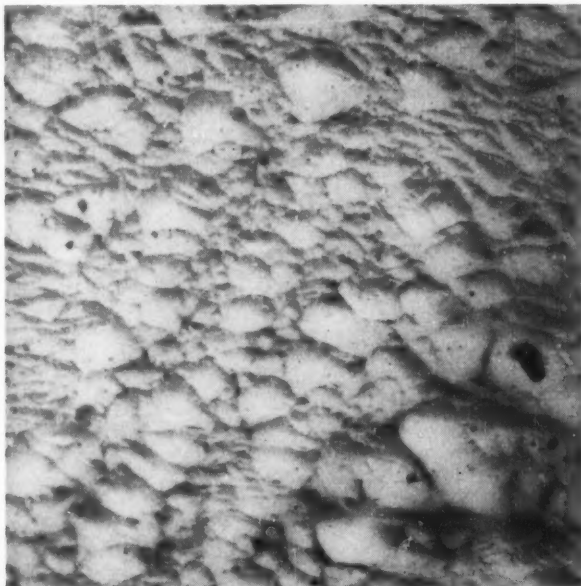


Fig. 27. Electron micrograph showing type IB-4 and 5, cyanide copper bath, 5.0 amp./dm.<sup>2</sup>, pH 12.5, 25°C., (1.5 × 10<sup>-4</sup> cm. thick). 15,000X.

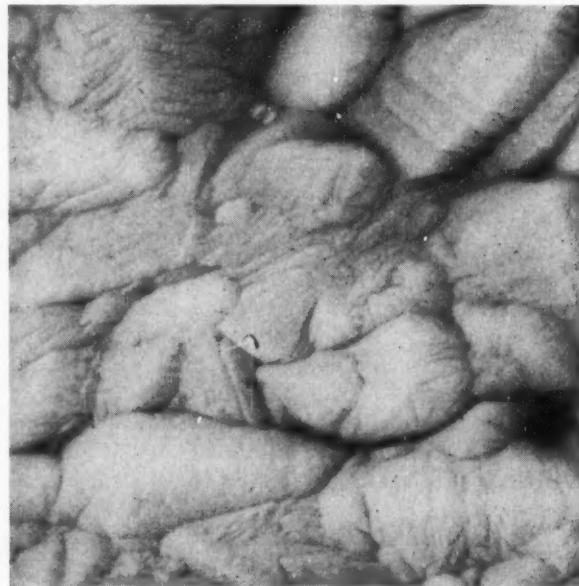


Fig. 28. Electron micrograph showing structure type IB-5, cyanide copper bath, 5.0 amp./dm.<sup>2</sup>, pH 12.5, 55°C. 15,000X.

those obtained in cobalt and nickel baths, which indicates that hydrogen evolution is low or absent in the copper bath. The potential relationships of copper are such that it can deposit from an acidic cathode film, whereas many authors believe that a basic cathode film is necessary for nickel deposition.

The structure shown in Fig. 6 and obtained in the acid copper bath consists of coarse columnar grains, perpendicular to the basis-metal. The platelet structure is also clearly evident. It was previously pointed out that copper deposits can be examined by the electron microradiography technique of plating a thin nickel film on the copper and then dissolving the latter. This method was principally used to see if the platelet structure is a true feature of the deposit or is introduced into the replica from extraneous sources such as the shadowing operation. Fig. 25 shows an electron microradiograph of an acid copper deposit. The picture confirms the presence of platelets in the structure. If the copper surface on which the nickel film is deposited is previously electropolished, a clearer platelet structure is obtained, as seen in Fig. 26.

Many of the experiments reported in the literature which have led to the generalization that the grain size of deposits decreases with increasing current density or decreasing temperature involved the deposition of copper. The relationships between grain size, temperature, and current density reported in the literature for copper were confirmed in the present investigation. The experiments on nickel and cobalt show, however, that the results which hold true for one bath cannot be applied as generalities.

The cyanide solution for copper deposition has to be basic to prevent the formation of poisonous gases. Deposition in the copper cyanide bath is also frequently accompanied by hydrogen evolution. It thus appears that the conditions at the cathode in the cyanide bath are similar to those in cobalt and nickel baths, and

consequently the cyanide copper structures should resemble those in cobalt and nickel. The experiments indicate this to be true. The copper structure shown in Fig. 27 finds its counterpart in nickel and cobalt. Owing to polarization, it was not possible to deposit a sample thicker than 0.06 mil at 5.0 amp./dm.<sup>2</sup> (50 amp./ft.<sup>2</sup>) and 25°C. (77°F.), as the voltage needed to maintain the current density exceeded that available from the power source. The results of this experiment therefore cannot be accurately evaluated. The other deposit plated at 5 amp./dm.<sup>2</sup> (50 amp./ft.<sup>2</sup>) possessed a coarse-grained structure. Some grains seen in Fig. 28 even approach the type II structure. The picture also shows that the grains possess a definite platelet structure. The theory that the surface becomes brighter with increasing current density seems to hold for the cyanide deposits, even though the grain size increases with current density.

*(To be concluded next month)*

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# Finishing Pointers

## Plating Within Limits

**Q**UALITY control is not new to the electroplater, who has been graphing and logging analyses and measurements on the bath and on the plating characteristics for many years. It is the basic method of operating within defined limits to keep out of trouble. Many baths have been operated by such methods with a record of no trouble for the entire history of the bath. Well defined limits and vigilant control methods have proved that operation without trouble is possible. The following account is an interesting illustration of the methods used to avoid trouble.

A check was made on plating baths being used by a job shop where only occasional analyses were made. The plater kept his baths in operating condition by practical methods and some outside help. Control was good but not always by the method of limits.

When a check was made on the bright zinc bath it was found that all chemicals were above the high limit. A plating range test was made with a slot cell and the indications were that the range was satisfactory as illustrated in the top panel section. It was then obvious that the zinc bath could be operated above the recommended high limit providing the chemicals were in the proper proportions. These proportions had been established by the practical control methods of the

**SLOT CELL**

**3 AMP.**

**BRIGHT**

**GREY**

**BRIGHT**

plater by watching the work and adding the needed chemicals.

The high chemical concentration in this bath was due to chemical solution of the zinc anodes and compensation for the increase in zinc content by addition of excess sodium cyanide and sodium hydroxide.

The problem was: What should be done? It was decided that the gradual increase in chemical content would eventually result in loss of control and that this could be avoided by dilution of the bath. So a small portion of the bath was diluted and adjusted to the low limits for the chemicals and a plating range check was made. The result was as shown in the bottom panel section. Apparently dilution would result in loss of plating range. Now the problem was more difficult. If the bath were diluted to the recommended concentration it could not be used at the same current density as a fresh bath or as in its present concentrated condition. Adjustment of the chemicals in the bath and use of addition agents did not help. It was suspected that the large dilution required resulted in the formation of colloidal precipitates due to the hard water used, or possibly in an unfavorable concentration of ammonia that was present in the bath. If either were the cause, time, heating or electrolysis should correct the trouble.

An adjusted sample of the bath was electrolyzed for several hours in a small cell and the plating range returned to normal. Although this did not pinpoint the trouble it did suggest a cure. Several hours of electrolysis in a small cell would be equivalent to several days in a large bath.

The condition could be corrected by small daily dilutions, since small dilutions did not effect the plating range. However such a scheme would require a long period of time to make the correction and the dilutions would be partially offset by chemical solution of zinc unless this problem were solved at the same time.

The bath was used for one more day and then work was scheduled for plating that could be economically plated at a lower current density. The bath was then diluted and adjusted to the low limits for concentration of chemicals. The bath was used for production at low current density for three days and, at the end of that time, the plating range was again normal.

This case history of a zinc bath illustrates that operation outside of the prescribed limits often means that drastic action will have to be taken. On the other hand it shows that trouble and corrective action can be anticipated by experimentation with small portions of a bath, using a plating range test as a guide.

Similar trouble can be encountered with a nickel bath. A very large dilution of a nickel bath can result in loss of adhesion. Unfortunately, this cannot be detected by a plating range test. Unless this trouble is anticipated and an adhesion test made, the trouble is liable to show up as blistered or peeled deposits on finished work. The correction for this trouble is also by electrolysis. By electrolysis followed by adhesion testing the time, current density and total current can be determined to correct the difficulty.



# Science for Electroplaters

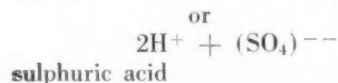
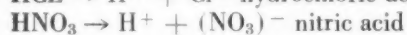
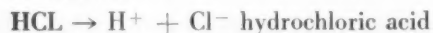
## 9. Solutions -- Equations

By L. Serota

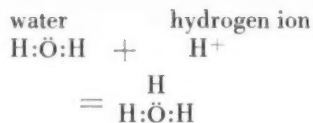
**P**LATING operations — including such cycles as the cleaning bath, electroplating bath, electropolishing, and pickling — employ solutions made up of materials classified as *acids*, *bases*, and *salts*. With the exception of organic agents, such as degreasing solvents (e.g. trichlorethylene) and some addition agents, the three classes of compounds named constitute the principal materials added to tank solutions. Classification of compounds as acids, bases, or salts implies for each division similarity in properties.

### Acids

Certain electroplating operations, such as pickling, acid dips, bright dips, etching, entail the use of acids. An acid is classified as a substance that will yield hydrogen ions in solution. Properties common to acids—pH values less than 7 (by electrometric or colorimetric method), neutralization of a base, and sour taste—are the properties of the hydrogen ion. The equations representing the ionization of a few acids when dissolved in water are as follows:



In a water solution, it is generally believed that chemical hydration (solvation) occurs, and the hydrogen ion exists as the hydrated ion  $(\text{H}_3\text{O})^+$ . It is also called the hydronium ion. The molecule of water with two unused pairs of electrons forms a coordinate link with the hydrogen ion (proton).

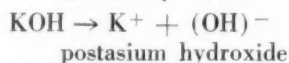
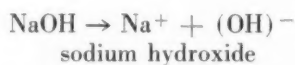


Hydronium (or oxonium) ion

For convenience and simplicity the ion is usually represented as  $\text{H}^+$ . The term *cation* applies to the positively charged ion, and the term *anion* to the negatively charged ion. In the examples given the cation is  $\text{H}^+$  and the anions are the chloride ion,  $\text{Cl}^-$ , the nitrate ion,  $(\text{NO}_3)^-$  and the sulfate ion  $(\text{SO}_4)^{--}$ . It is evident that the hydrogen ion is the characteristics cation of acids; the anion, however, will depend upon the acid used.

### Bases

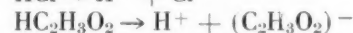
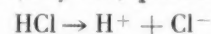
The water solution of bases (alkalies) will give the hydroxide ion  $(\text{OH})^-$ , to which the common properties of bases are due. Some of these properties are: bitter taste, slippery feeling, emulsifying and saponifying action on soil in a cleaning bath, neutralizing acids, changes in color of pH paper indicating a pH value more than 7. Equations showing ionization of solutions of some common bases are:



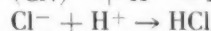
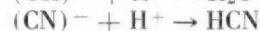
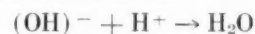
The anion  $(\text{OH})^-$  is the characteristic ion for bases. The cation will depend upon the base (alkali) used. In the examples cited the cations are sodium ion,  $\text{Na}^+$ , potassium ion,  $\text{K}^+$ .

For the study of solutions of acids and bases including those made with solvents other than water (non-aqueous), the acid-base theory was extended in 1923 by T. M. Lowry and J. N. Bronsted to interpret acids in terms of proton donors and bases in terms of proton acceptors. According to this view, any substance is considered an acid if it can give up one or more protons,  $(\text{H})^+$ . This broader theory includes, in addition to those substances previously classified as acids, compounds or radicals containing hydrogen and capable of losing a proton. Acids are considered strong or weak acids to the degree that protons will be given up. Hydrochloric acid (muriatic acid) is considered a strong acid because of its marked tendency to give up protons, whereas acetic acid  $(\text{HC}_2\text{H}_3\text{O}_2)$  is classified as a weak

acid owing to the lesser tendency to lose protons. Water by this definition is considered an acid because it does lose (very few) protons:



A base by this definition is a substance which can gain protons. The term base, therefore, is not limited to those compounds which yield hydroxyl ions,  $(\text{OH})^-$ . Many anions as well as water must now be included in this classification of bases.



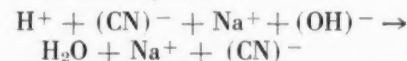
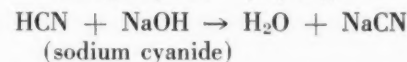
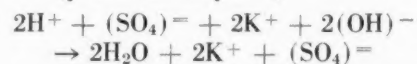
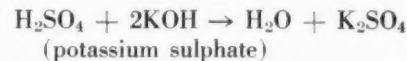
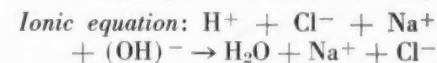
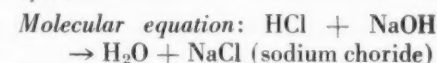
As with acids, but in reverse, the strength (or weakness) of a base is determined by the tendency indicated to unite with a proton. It is interesting to note the dual properties of water by this new classification:

as an acid:  $\text{H}_2\text{O} \rightarrow \text{H}^+ + (\text{OH})^-$   
proton donor

as a base:  $\text{H}_2\text{O} + \text{H}^+ \rightarrow (\text{H}_3\text{O})^+$   
proton acceptor

### Salts

When a solution of an acid is mixed with a solution of a base, in proper (equivalent) proportions, the hydrogen ion  $(\text{H})^+$  furnished by the acid and the hydroxyl ion  $(\text{OH})^-$  from the base combine to form water. The metal cation of the base and the non-metallic anion of the acid react to form a compound known as a salt. This process is known as neutralization. If the water formed is evaporated, the salt remains. Neutralization is one of the methods employed in treating acid pickles, bright dips, and stripping solutions, before discharging into the city sewer system.



The fundamental reaction in neutralization involves the union of the hydrogen ion (proton) of the acid and

the hydroxyl ion of the base to form water.



The remaining ions stay in solution as ions of the salt resulting from this process of neutralization.

Salts will also form by the action of acids on some metals or oxide coatings. Some examples are, pickling by chemical immersion or the electrolytic (cathodic or anodic) process; acid dips and bright dips. The salts formed by these processes are soluble. Iron (ferrous) chloride or iron (ferrous) sulfate are salts formed (depending upon which acid is used) in an iron pickle; copper nitrate, zinc nitrate and cadmium nitrate are examples of salts formed in bright dips. Hydrogen formed in pickling operations is changed (oxidized) to water if an oxidizing agent is present.

### Nomenclature

Compounds are named according to certain rules. When a compound consists of two elements it is called a "binary" compound. The names of binary acids include the prefix "hydro" and the suffix "ic."

Hydrofluoric acid — HF

Hydrochloric acid — HCl

The name of a binary salt or oxide is derived by using the names of the elements making up the compound followed by the ending (suffix) "ide."

nickel chloride — NiCl<sub>2</sub>

aluminum chloride — AlCl<sub>3</sub>

sodium chloride — NaCl

iron (ferrous) chloride — FeCl<sub>2</sub>

cadmium oxide — CdO

zinc oxide — ZnO

iron (ferric) oxide — Fe<sub>2</sub>O<sub>3</sub>

copper (cupric) oxide — CuO

Some compounds that contain radicals are classified as binary compounds. The radical (enclosed in parenthesis) in such instances is considered an element, and the same ending "ide" is used.

sodium hydroxide — Na(OH)

potassium hydroxide — K(OH)

sodium cyanide — Na(CN)

ammonium chloride — (NH<sub>4</sub>)Cl

When binary compounds are formed with metals exhibiting more than one valence, the ending (suffix) "ous" is used after the first element for the lower valence compound and the ending "ic" as the suffix after the first element for the (higher valence) compound. The characteristic ending "ide" for

binary compounds is of course, included.

cuprous cyanide — CuCN

cupric cyanide — Cu(CN)<sub>2</sub>

Aurous (gold) cyanide — AuCN

Auric chloride — AuCl<sub>3</sub>

stannous (tin) chloride — SnCl<sub>2</sub>

stannous (tin) chloride — SnCl<sub>2</sub>

Ferrous (iron) hydroxide — Fe(OH)<sub>2</sub>

Ferric hydroxide — Fe(OH)<sub>3</sub>

*Oxyacids* comprise the group of acids containing oxygen as the third element in the compound, such as HNO<sub>3</sub> (nitric acid), H<sub>2</sub>SO<sub>4</sub> (sulphuric acid), H<sub>3</sub>PO<sub>4</sub> (phosphoric acid), H<sub>3</sub>BO<sub>3</sub> (boric acid). Where more than one acid is formed with an element because of different valences, the ending "ous" is used for the name of the acid containing the element with the lower valence; salts formed from this class of acids will have the ending "ite." The ending "ic" is used for the acid in which the element exhibits the higher valence; and salts of the higher valence acids have the ending "ate."

#### Acid

#### Salt

sulphurous acid, H<sub>2</sub>SO<sub>3</sub> →  
sodium sulphite, Na<sub>2</sub>SO<sub>3</sub>

sulphuric acid, H<sub>2</sub>SO<sub>4</sub> →  
sodium sulphate, Na<sub>2</sub>SO<sub>4</sub>

nitrous acid, HNO<sub>2</sub> →  
sodium nitrite, NaNO<sub>2</sub>

nitric acid, HNO<sub>3</sub> →  
sodium nitrate, NaNO<sub>3</sub>

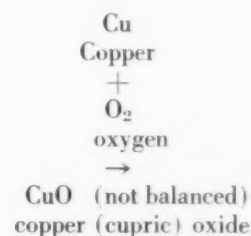
Sodium sulphite is used in the bath formula for the salt-water gold plating process. It is recommended for use in copper cyanide (or brass) solutions for giving brighter deposits and aiding good anode solution. Sodium sulphate is used in an indium bath formulation and in the high sulphate nickel bath used to plate nickel on zinc. Sodium nitrite is used in the amino-nitrite platinum bath and in the sodium palladium nitrite bath. Sodium nitrate is used in the formulation for the diamine-nitrite palladium bath. Potassium nitrate (the salt formed when potassium hydroxide is neutralized by nitric acid) is recommended for use in a silver bath, especially when carbon disulphide is the brightener.

### Chemical Equations

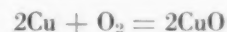
The quantities of materials required in a chemical reaction are based upon the ratio by weight (volume may also be considered for gases) of the reacting reagents. The weight of barium carbonate, for example, added to a

chromium tank solution to maintain the correct sulphate ratio is determined in such manner. The chemical changes may be represented by equations. Writing equations entails a knowledge of formulas which is based upon the valence of elements and radicals. The correct equation for a reaction must be balanced, so that the total quantity (weight) of material taking part in the reaction is the same as the expected quantities in the final products. To balance an equation, the total number of atoms and the weights of the atoms represented must be equal before and after completion of the chemical reaction. This is known as the principle of conservation of mass or matter. It may be stated as follows: In all chemical and physical changes the total mass remains the same; or, as it is frequently expressed, matter can be neither created nor destroyed.

For a simple example, consider the metal oxide film that results when copper-rich alloy is annealed:

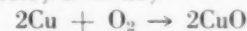


The oxygen molecule, as with most gases, is diatomic (two atoms) and is therefore represented as O<sub>2</sub>. Since one atom of oxygen unites with one atom of copper to form the compound copper oxide (CuO), a second atom of copper must be indicated in the equation to combine with the remaining atom of oxygen in the molecule. The *balanced* equation is:



The atomic weights of the elements obtained from atomic weight tables may be shown directly below the elements in the equation. (Atomic weights:

Cu = 63.6; O = 16)



*atomic weights:*

$$2(63.6) + 2(16) = 2(63.6 + 16)$$

*formula weights:*

$$137.2 + 32 = 159.2$$

*equation weights:*

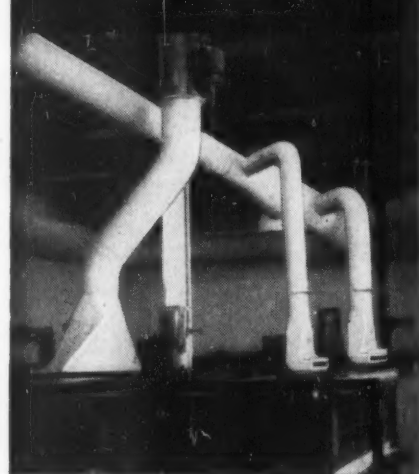
$$159.2 = 159.2$$

The equation shows that 137.2 parts by weight of copper and 32 parts by weight of oxygen (total = 159.2) pro-

# FROM RAINCAP TO HOOD



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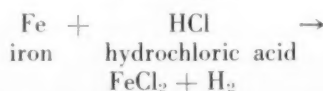
THE *Chemical* CORPORATION

Dept. 58 • West Warren, Massachusetts

duce 159.2 parts by weight of copper oxide. Since the number of atoms and the weights of the atoms for the materials taking part in the chemical change are the same, the equation is said to be balanced.

Another example representing such calculations would be the pickling action of muriatic acid on iron or steel.

### UNBALANCED



iron (ferrous) chloride + hydrogen

Since the hydrogen evolved escapes as a gas, it exists as the diatomic molecule ( $\text{H}_2$ ). To balance the equation two molecules of HCl would be required to provide the two hydrogen atoms needed to form a molecule of hydrogen.

### BALANCED



atoms:

1 atom iron + 2 atoms hydrogen  
+ 2 atoms chlorine =  
1 atom iron + 2 atoms hydrogen  
+ 2 atoms chlorine

total atoms: 1 + 4 = 3 + 2

Atomic weights:

Fe = 56; H = 1; Cl = 35.5



atomic weights:

56 + 2(1+35.5) =  
56+35.5 + 35.5 + 2(1)

formula weights: 56 + 73 = 127 + 2

equation weights: 129 = 129

Elements and compounds, it will be noted, unite in fixed proportions by weight. In the two reactions shown 137.2 parts by weight of copper unite chemically with 32 parts by weight of oxygen to form 159.2 parts by weight of copper oxide and 56 parts by weight of iron react with 73 parts by weight of hydrochloric acid to form 127 parts by weight of iron chloride and 2 parts by weight of hydrogen. Since the ratio of combining weights is constant, proportionate parts of the weights of the reacting substances may be taken. If one tenth of the weight of copper, 13.72 instead of 137.2 parts by weight were used, then only one tenth of the weight of oxygen, 3.2 instead of 32 parts by weight would be required to combine with the copper. Presented as a problem, if 13.72 parts by weight of copper were used, how many parts

by weight of oxygen would be required for the reaction?

By proportion:

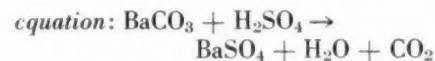
$$\begin{array}{rcl} \text{copper} & & \text{oxygen} \\ 13.72 & = & X \\ \hline 137.2 & & 32 \\ 137.2 X = 13.72 \times 32 \end{array}$$

$$X = \frac{13.72 \times 32}{137.2}$$

X = 3.2 parts by weight of oxygen

This method of calculation may be applied, for example, to a problem based upon the addition of 6 pounds of barium carbonate to a chromium tank solution. If it is assumed that the reaction occurs with the sulphuric acid in the tank, then the weight of the acid with which the barium carbonate reacts can be determined from the equation by the following steps. Atomic weights: Ba = 137; C = 12; O = 16; S = 32; H = 1. Whole numbers are used for simplicity.

actual weights: 6 lbs. X lbs.



atomic weights:

(137 + 12 + 48) (2 + 32 + 64)

formula weights: 197 98

check:

Ba = 137 × 1 = 137

C = 12 × 1 = 12

O = 16 × 3 = 48

197

H = 1 × 2 = 2

S = 32 × 1 = 32

O = 16 × 4 = 64

98

6 X

— = —

197 98

197 X = 6 × 98

6 × 98

X = —

197

= 2.9 pounds sulphuric acid

Given the weight of one of the materials taking part in a reaction, then the values for any of the materials represented by the equation may be calculated by this method.



# SHOP PROBLEMS

ABRASIVE METHODS SURFACE TREATMENTS CONTROL  
ELECTROPLATING CLEANING PICKLING TESTING



METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

## Plating Costs

*Question:* We would like to obtain your recommendation for technical data, to be used by this company in calculating the cost of electroplating. Would you be kind enough to advise the name of any publishers that you may know of on the subject?

J. E. W.

*Answer:* The most comprehensive data available will be found in chapter 12 of the recently published "Electroplating Engineering Handbook," edited by A. K. Graham.

## Tungsten and Vanadium Baths

*Question:* We are interested in the possibility of plating tungsten or vanadium, or a tungsten-vanadium alloy, or an iron-vanadium alloy for high temperature wear resistance.

E. J. M.

*Answer:* Our files show no references on the successful electrodeposition of vanadium or vanadium alloys. However, tungsten can be plated as an alloy with iron, nickel and cobalt and other metals. The patent and technical literature contains many references to this subject. These are summarized in the book "Modern Electroplating," edited by Allen G. Gray.

## Recovery of Silver from Strips

*Question:* I have a silver recovery problem about which I would like some information.

I wish to recover the silver from a cyanide silver strip solution. This solution is the regular cyanide-water solution. We have used it a couple of years and I find it stripping slowly, and there is a quantity of sludge in the bottom of the tank. Too, I feel

that the solution itself contains much silver. How do I sludge down all the silver from the solution? I wish to make up a new strip but want to recover all there is in the present one. This present strip is a 100 gallon solution.

Likewise, I have another strip for stripping silver from brass and copper. This acid strip is made up of 20 gallons sulphuric and a small amount nitric. It, too, has much silver already precipitated, but I know there must be some more in the acid. How may I recover the silver from this acid? I do not want to recover the metal for reuse, just to concentrate it to send to the refiner.

R. L. S.

*Answer:* Since practically all the silver will deposit on the cathodes or drop to the bottom of the cyanide strip tank as a silver mud, there would, ordinarily, be practically no silver in the solution worth recovering. The solution can be dumped and a new one prepared.

To recover the values from the sulfuric-nitric acid strip, the solution should be diluted with water and a strong solution of table salt added until no more curdy-white precipitate of silver chloride forms. The precipitate should be allowed to settle and washed with water a few times, after which it can be sent to the refiner.

## Oxidize for Brass and Silver

*Question:* I would like to use a single dip for oxidizing both silver and brass. I do not want to use sulfide in my jewelry plant and I have heard that arsenic and antimony solutions are em-

ployed. Can you furnish me with any information on these dips?

B. F. B.

*Answer:* The common oxidizing solution for silver and brass, aside from polysulfide which is not suitable for the latter, is tellurium tetrachloride dissolved in muriatic acid. A stock solution can be made up with 1 oz. of tellurium dioxide in 8 fluid oz. of acid. This is diluted, as required for painting on or dipping. The salts are obtained from many jewelry supply houses or plating supply firms under various trade names.

Antimony and arsenic salts produce a good black but have a tendency to diffuse into silver so that, after a few months, the silver appears white again. A suitable arsenic plating process will be found in the METAL FINISHING GUIDEBOOK.

## Resistant Gold Finishes

*Question:* We beg to thank you for your letter of the 13th instant regarding the Hamilton finish. However, we are not looking for the color but for the quality. We have seen many pieces of American manufacture which were thus gilded and had a very great resistance. These pieces come from a large supplier in Providence.

E. G. W.

*Answer:* The quality and resistance to tarnish of most good American costume jewelry is due to the use of the hot bright nickel process for applying an undercoat for the gold finish. In addition, some manufacturers use what is known as a hard gold undercoat. This is a gold solution containing nickel as a hardener. The result is to increase the nitric acid test resistance.

## Sealing Porous Materials

*Question:* Do you know of an impregnant for very porous woods (or other materials) which will harden completely at temperatures under 150° F., the object of such impregnation

feature should be called on less than its ability to protect the cleaned surface from contamination.

The zinc ammonium chloride corresponding to the formula  $ZnCl_2$

reducing atmosphere. Such studies have led to a final shortening of the total time through the zinc kettle for many products, including continuous processes for wire and strip.

## NEW LEVELUME PROCESS INTRODUCED BY H-VW-M

FIRST NICKEL PLATING PROCESS COMBINING FULL BRIGHTNESS WITH  
"TRULY AMAZING LEVELING" ANNOUNCED BY MATAWAN, N. J. FIRM.

Matawan, N. J.—Levelume, a new bright nickel process giving deposits combining "full brightness with truly amazing leveling," was released for general use today by Hanson-Van Winkle-Munning Company, Matawan, N. J., suppliers to the metal finishing industry. Officials of the company stated that the Levelume Process is a milestone—the first nickel process to combine qualities of brightness, high leveling and exceptional speed.

Years of research went into the development of the process, and the result, according to H-VW-M officials, is a process imparting "optimum qualities of brightness, leveling, surface activity, ductility and controlled stress at

exceptionally high deposition rates." The process has already been field tested in several high production automatic conveyors. One leading auto parts producer, it is reported, has increased production well over 100% without investing in new conveyors, enlarging tanks or changing racking methods.

Newly discovered addition agents are the key to the phenomenal success of Levelume. With the new process, plating is done at higher temperatures and higher current densities. Air agitation and continuous filtration through activated carbon prevent contamination build-up that normally leads to deterioration of the deposit's physical properties.

Replacing the muriatic acid flux wash water solution of zinc ammonium chloride found wide acceptance ago in all fields except some of

$3NH_4Cl$ , has remained unchanged during these years. Much has been learned about the things that can be done with this compound itself and its water solutions. The melting point is recorded as 644 degrees Fahr., and only at this temperature the salt

quality treatment. A special arrangement flow of current as the Leads (D) are contacted during the assembly during the work reaches the place.

Modern requirements protective finishes on industrial products are expanding need for automatic finishing machinery—like Automatic Conveyor Systems—metal finishing—attained—never before attained—is reality for almost every industrial application.

Whether the operation the process complex or automatic conveyor system specially designed to provide quantitative production.

Fully automatic systems—synchronized flow—automatically contacted through an end cycle. Without a single rack can be transferred tank, dipping or by-passing may require, delivering discharge on a perfectly Plating, anodizing, stress cleaning, phosphate cleaning, painting, etching other finishing processes economically and economically.

Constant leadership development over ensures a complete precision finishing efficiency of conveyor systems is understanding.

Self-lubricating (E) is used for either one of the steps in the over circuits may be conveyor.

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INDUSTRY'S WORKSHOP FOR THE

METAL FINISHING, December, 1955

# Levelume

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**WIDE CURRENT DENSITY RANGE** — Can vary from 20-150 asf (normal 60-100 asf). Higher current densities mean faster plating and reduction in equipment, floor space and manpower.

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**CONTROLLED STRESS**—No cracking, crazing, lifting or brittleness of deposits.

**HIGH DUCTILITY** — Comparative tests show good ductility, maintained even after continued bath use.

**EXCELLENT CORROSION PROTECTION**—Equal to deposits from other bright or leveling solutions.

**VERSATILE**—Can be used as single coating or, if higher corrosion protection is desired, a Nickle-Lume top coat can be applied.

**EASY SOLUTION CONVERSION TO LEVELUME**—With few exceptions other bright nickel baths can be converted.

**HIGH SURFACE ACTIVITY** — Plated surfaces accept chromium and other deposits without activating treatments. You'll experience none of the ordinary difficulties of other bright nickel processes with LEVELUME. One manufacturer reduced chromium plating rejects 12 per cent using Levelume.

**— and these advantages, too . . .**

- Bath Stable in Operation
- Pleasing White Color Deposits
- Simple Control
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- High Tolerance to Impurities
- Low Operating Costs

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METAL FINISHING, December, 1955



## H-VW-M



being to fill, as completely as possible, all accessible voids.

A substance hardening completely at room temperature would be ideal. It cannot contain water, however.

W. F. K.

*Answer:* Porous materials are generally filled with wax or lacquer by brushing, spraying or dipping. If wax is used, a few coats of shellac are applied afterward. Wax has the advantage of filling very effectively when warmed, but also has the disadvantage of poor adhesion of subsequent coatings.

If lacquer is used, the first coats should be thinned down so that it will penetrate into the pores.

### Electropolishing Silver

*Question:* I am badly in need of an electropolishing solution for sterling silver handmade jewelry. I wrote to half a dozen places listed in the Guidebook under electropolishing solutions and none of them handle solutions for sterling silver.

W. J.

*Answer:* The most practical electropolishing solution for silver is a standard silver plating solution with low free cyanide. A typical formula would contain about 4 tr. oz./gal. metallic silver, 6 oz./gal. potassium carbonate and about 2-2.5 oz./gal. free potassium cyanide. This solution is used at room temperature and 2.7-3.5 volts.

A number of modifications have been patented, employing specified agitation procedures and alternating current superimposed on the direct current. Abstracts of these patents will be found in back issues of METAL FINISHING.

### Preventing Silver Tarnish

*Question:* We are manufacturers of electronic parts, the majority of which are silver plated. We have had considerable trouble caused by the tarnish of the silver after parts have been exposed to the air for any appreciable time.

I understand there are tarnish-free finishes. One of our customers suggested a white alloy deposit and anti-tarnish dips. We do not have any information on any of these processes and would appreciate any information you could give to us.

T. D. M.

*Answer:* We know of no practical method to prevent silver from tarnish-

ing when exposed to sulfur-containing atmospheres, without effecting the electrical conductivity.

White alloy deposits may not be permissible on silver plated electronic parts. As you know, gold deposits are generally employed over the silver for this purpose, since it has good conductivity.

### Chromium Plating Crankshafts

*Question:* We have a problem here in connection with the hard chrome

plating of engine crankshafts. It would appear desirable to rotate the crankshaft during the plating operation. Do you know of anyone who makes a machine for doing this? Are there plans available for constructing such a machine?

W. J. M.

*Answer:* A number of companies manufacture rotating equipment for plating rolls and shafts. This equipment could probably be employed for crankshafts also. We are enclosing a list of same.

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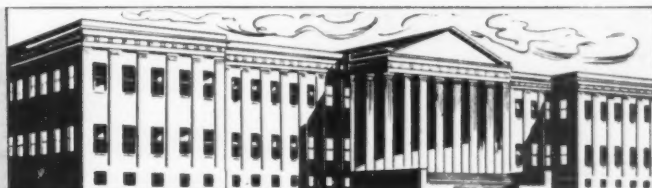
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Chicago 5  
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# Patents

RECENTLY GRANTED PATENTS  
IN THE METAL FINISHING FIELD



## Silver Coating

*U. S. Patent 2,705,830. Apr. 12, 1955.  
H. S. Lukens, assignor to the United States of America*

A metallic coated article comprising a base having a higher melting point than silver, a thin porous silver coat on said base, said silver coat being of a thinness of less than about .0015 inch, and a water-insoluble fused silver salt having a lower melting point than said metallic base, said silver salt being on the exterior of said silver coat and being retained in and closing the pores of said silver coat.

## Rotary Brush

*U. S. Patent 2,705,855. Apr. 12, 1955.  
N. E. Nielsen, assignor to Newark Brush Co.*

A unit brush supporting and cooling member comprising a disc of suitable material, the disc having a central body portion with means for mounting it on a drive member and an offset rim terminating in an annular flange and a plurality of arcuately positioned air scoops formed outwardly on said central portion, the scoops terminating in depressed parts extending across the rim and outwardly in the flange thereby forming an air passage from the scoop to the outer edge of the flange as and for the purposes described.

## Hot Dip Aluminum

*U. S. Patent 2,706,161. Apr. 12, 1955.  
T. H. Westby*

The method of providing a base metal with a coating of aluminum passing the base metal through a flux consisting essentially of an aqueous solution of zinc chloride in the amount of about one pound per gallon of solution; lead chloride in the amount of about one-half of an ounce per gallon of solution; and about 15 cc. of hydrochloric acid per gallon of solution; and then passing the so-treated base

metal through an aluminum bath present in a treatment-kettle, said fluxing solution reducing to a minimum the production of dross on the aluminum bath and also preventing accumulation of sludge on the bottom of the kettle.

## Electroforming Low Stress Nickel

*U. S. Patent 2,706,170. Apr. 12, 1955.  
V. J. Marchese, assignor to The Sperry Corp.*

A method of producing electroformed nickel articles which comprises immersing as a cathode a mandrel of the article to be formed and a nickel anode in a Watts plating bath with a pH value of substantially 4.5, subjecting the bath to a direct current of between 10 and 50 amperes per square foot and D.-C. voltage having a superimposed A.-C. voltage of a peak magnitude of substantially three times that of the D.-C. plating voltage to electrodeposit nickel having minimized internal stress upon the mandrel, withdrawing the electroformed nickel article and mandrel from the bath, and removing the electroformed nickel article from the mandrel.

## Metallizing Ceramic

*U. S. Patent 2,706,682. Apr. 19, 1955.  
R. M. Barnard and S. E. Buckley, assignors to International Standard Electric Corp.*

Method of forming a ceramic body having at least part of the surface thereof coated with a firmly adherent coating of metal chosen from the class containing silver, copper, iron and nickel comprising the steps of sintering together powdered ceramic material from the group consisting of kaolin, talc and titanium dioxide and powdered oxide of said metal into a hard body with the metal oxide on at least part of the surface, heating said body to a temperature above the melting point of the said oxide to cause the said oxide to bond firmly to said

ceramic and subsequently reducing the oxide to metal.

## Porcelain Enameling

*U. S. Patent 2,706,692. Apr. 19, 1955.  
A. E. Chester, assignor to Poor & Co.*

A method of controlling the adherence of vitreous enamels to ferrous metals which consist essentially in forming a layer of an elemental substance from the group consisting of sulfur and selenium on a ferrous metal base stock, covering said layer with a thin coating of a metal from the group consisting of antimony, arsenic and bismuth, applying a coating of a vitreous enamel over said metal coating, and firing said enamel.

## Iron Plated Chromium

*U. S. Patent 2,706,329. Apr. 19, 1955.  
W. G. Hespenheide, assignor to Michigan Bumper Corp.*

As an article of manufacture, a chromium surface and a layer of iron on said surface, said iron layer having a thickness of at least 0.0001 inch and not greater than 0.002 inch, and characterized by having substantially entirely preferred orientation with the (110) crystallographic plane parallel to the surface thereof and rotational symmetry about the fiber axis which is perpendicular to said surface.

## Electrodeposition of Titanium

*U. S. Patent 2,707,170. Apr. 26, 1955.  
E. Wainer, assignor to Horizons Titanium Corp.*

A process for electrodepositing titanium metal in the form of a coarse crystalline electrodeposit from a fused salt bath which comprises: preparing a fused electrolyte consisting essentially of at least one alkali metal halide from the group consisting of alkali metal chlorides, alkali metal bromides and alkali metal iodides and between 2% and 30% by weight of at least one alkali metal fluotitanate, introducing substantially pure titanium monoxide

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into the said fused electrolyte to form a fused salt cell bath, passing an electrolyzing current through the fused bath between an anode and a cathode in contact with said bath, and recovering the resultant cathodically deposited titanium.

### Hot Galvanizing

*U. S. Patent 2,708,171. May 10, 1955.*  
*C. L. Inglefeld, Jr., assignor to U. S. Steel Corp.*

In the high speed continuous galvanizing of steel strip, wherein the strip is led continuously at minimum speeds of about 100 feet per minute through a bath of molten zinc at a temperature of 800° to 875°F. and

emerges between a pair of grooved coating rolls located at the bath surface, a method of preventing the zinc coating on the strip from attaining excessive thickness immediately adjacent the side edges of the strip and yet maintaining a uniformly spangled surface across the width of the strip comprising directing gas flames downwardly against the portions of the strip surface immediately adjacent the side edges as the strip emerges from the coating rolls before the coating solidifies, and thereby both mechanically blowing away excess zinc and heating these portions of the strip, such heating being confined to these portions and controlled to maintain them at the temperature at which they

leave the bath for a longer time than the portions of the strip inwardly of the side edges without appreciably raising the temperature of any portion of the strip above that of the galvanizing bath.

### Corrosion Preventive

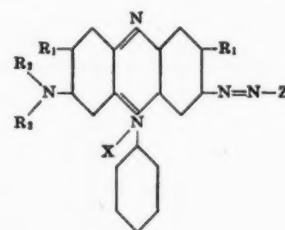
*U. S. Patent 2,706,714. Apr. 19, 1955.*  
*W. B. Hughes and R. E. Lembecke, assignors to Cities Service Research and Development Co.*

As a new composition of matter, a compound formed by heating together two mols of acetone and one mol of quinoline at reflux temperature and discontinuing the heating when the temperature of the reaction mixture has risen to about 85°C.

### Acid Copper Bath

*U. S. Patent 2,707,166. Apr. 26, 1955.*  
*H. Brown and R. A. Fellows, assignors to The Udylyte Corp.*

A bath for the electrodeposition of copper, comprising an aqueous acidic solution of a material selected from the group consisting of copper sulfate and copper nitrate, and minor proportions of a compound having the structure:



wherein  $R_1$  and  $R_2$  are radicals selected from the group consisting of hydrogen, methyl and ethyl radicals,  $X$  is an anion selected from the group consisting of chloride, bromide, iodide, fluoride, sulfate, bisulfate and nitrate, and  $Z$  is an aromatic radical selected from the group consisting of phenyl, naphthyl, and phenyl and naphthyl radicals substituted with amino, alkyl substituted amino, hydroxy and alkoxy substituent groups.

### Wire Plating Contact Finger

*U. S. Patent 2,708,181. May 10, 1955.*  
*A. W. Holmes and R. H. Burns, assignors to Indiana Steel & Wire Co.*

The process of electroplating a metal article with metal, consisting in mechanically moving that metal article through an electrolyte containing a solution a salt of the metal to be deposited, passing an electric current

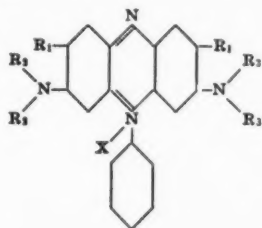


through said electrolyte with said metal article as the cathode, and supplying said electric current to said metal article by a contactor with which said moving article is in rubbing engagement within the electrolyte, the article-engaging portion of said contactor being made of at least one metal from the group consisting of tungsten, molybdenum, tantalum, columbium, zirconium, and hafnium.

#### Acid Copper Bath

U. S. Patent 2,707,167. Apr. 26, 1955.  
E. W. Hoover, assignor to The Udyline Corp.

A bath for the electrodeposition of copper, comprising an aqueous acidic solution of copper salts and minor proportions of a compound having the structure:



wherein  $R_1$ ,  $R_2$  and  $R_3$  are radicals selected from the group consisting of hydrogen, methyl, ethyl and phenyl radicals and  $X$  is an anion selected from the group consisting of chloride, iodide, fluoride, sulfate, bisulfate and nitrate.

#### Acid Pickling Inhibitor

U. S. Patent 2,708,184. May 10, 1955.  
K. F. Hager and M. Rosenthal, assignors to the United States of America

A composition of matter for pickling ferrous metals consisting essentially of an aqueous solution of sulfuric acid carrying dissolved therein a sufficient amount of a tincture of iodine to the extent of between about 0.002% and about 0.1% by weight of said solution.

#### Aluminum Coated Articles

U. S. Patent 2,708,304. May 17, 1955.  
H. Lundin, assignor to Helen Marie Lundin and Birgit Waller

An aluminum coated ferrous metal article, characterized in that the aluminum layer is bonded to the ferrous metal base by an intermediate intermetallic layer composed essentially of 35% to 65% by weight each of iron and aluminum and from 0.2% to 2.5% by weight of one of the metals zircon-

ium and titanium, the proportion of said last-mentioned metal to aluminum in the intermetallic layer being at least twice as great as the proportion thereof to aluminum in the aluminum layer.

#### Cadmium Plated Aluminum

U. S. Patent 2,709,847. June 7, 1955.  
M. L. Ihrie and F. A. Root, assignors to Bendix Aviation Corp.

The method of plating a cleaned and etched body having aluminum as its major and essential constituent that comprises plating it with zinc by immersion, plating it with one of a group consisting of copper and nickel by electrolysis, plating it electrolytically with cadmium from a cyanide bath, coating it with chromate, and baking it.

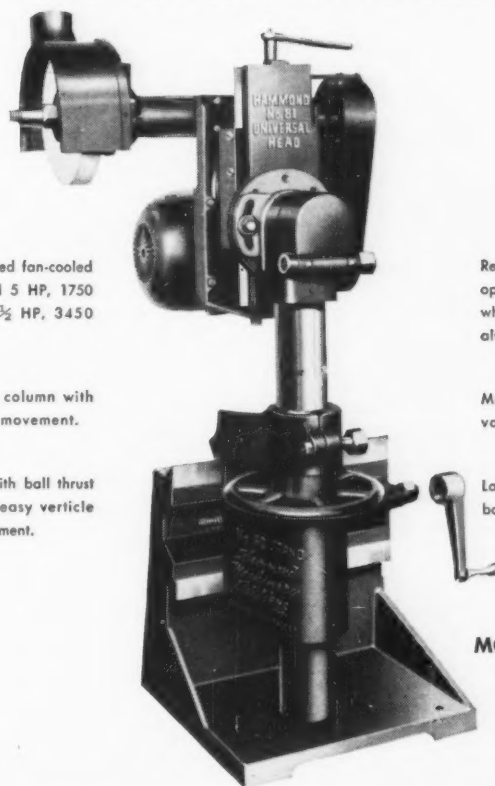
#### Gas Plating

U. S. Patent 2,710,817. June 14, 1955.  
W. W. Castor

The metallurgical method which comprises mix-iodine into the ester of a polyvalent metal and thereafter heating the mix to break down and remove the organic constituents of the compound and sublimate the iodine, leaving the sponge metal of said polyvalent metal as a residue.

The metallurgical method as defined in claim 1 in which the ester-iodine mix is applied to the surface of an object and the heating is continued after sublimation of the iodine to a temperature where the residue metal is fused to the surface of the object.

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## ABSTRACTS

The following papers were read at the *Galvanotechnik Arbeitstagung* (Plating Conference) held October 1954, at Darmstadt, Germany, sponsored by the *Forschungsgesellschaft Blechverarbeitung* (Research Institute for Sheet Metal Processing).

### Electropolishing

By Dr. Bosdorf

Electropolishing techniques can become an important auxiliary to plating. Homogeneity of the metal being processed by electropolishing is of importance. With present day techniques it is possible to electropolish satisfactorily austenitic stainless steels under special working conditions, and also high carbon steels, pure aluminum, copper, brass, nickel, etc. As recent tests have shown, it is also possible to electropolish after chromizing.

After discussing the various current theories on the fundamentals of the electropolishing procedure, the electropolishing electrolytes used in practice were then considered and details regarding the operational data were given. A total of 63 German and foreign patents indicates the importance which this process has attained commercially.

As compared with mechanical polishing, electropolished products, in a manner similar to chemically brightening, show a higher corrosion resistance to corrosive attack, and the surfaces also have a lower coefficient of friction. As regards the stability of the electropolishing baths on the basis of phosphoric-sulfuric acid, it is of interest to note that, with large scale baths on the practical scale, it is still possible to achieve a good electropolishing effect with 150 g./l. of dissolved iron. Fields of application for the electropolishing process are those particularly where the polishing effect cannot be achieved by mechanical polishing; the coupling together of these two processes commercially can also lead to a rational method of working.

Mention was made of the good current efficiency of the acetic-perchloric

acid electropolishing bath. Theoretical discussions regarding the solution mechanism of electropolishing baths indicate that scientific clarification in this direction has not yet been obtained. No Beilby layer is produced with an electropolished surface. A disadvantage of the process lies in the fact that very high current densities must be used. This is particularly the case with carbon-containing steels, which must be processed at room temperatures with current densities of up to 200 amp./sq. dm. The operating conditions with aluminum are somewhat more favorable (20-50 amp./sq. dm.) and more favorable still with brass and copper (5-7 amp./sq. dm.). The time in the electropolishing bath ranges from a few seconds to several minutes.

### Chemical Polishing of Aluminum

By von Uslar

The author discussed in detail the Erftwerk process and the Alupol process. The Erftwerk process works with a relatively large amount of water and fluorides while the Alupol process uses an acid mixture of phosphoric acid, acetic acid, and nitric acid; other acid combinations are also used. Comparative tests were conducted to ascertain the differences between the two processes. It was found that, with the Erftwerk process, a higher directional and also total higher reflection was always obtained. It was only when very thin, subsequently applied anodized coatings were applied that the reflective characteristics were then somewhat the same.

With increasing thickness of the anodized coating, the reflective characteristics of the aluminum surface processed by the Alupol process falls off to a greater extent than that treated by the Erftwerk process. The total reflection of a 99.57% aluminum, for example, falls from 90 to 60%. It seemed obvious that, with the alkaline Erftwerk process, the surface is freed from impurities in a more effective manner so that a particularly transparent oxide coating is obtained.

The Erftwerk process was specially developed for the polishing of pure aluminum but is also suitable for certain magnesium alloys. The Alupol process can be used for the processing of pure aluminum, Al-Mg 3, and alloys which contain up to 1% of silicon. In

themselves, the brightening effects obtained with the two baths do not differ very much. As regards the material removal, the Alupol process is even somewhat more favorable. If the polished parts are to be subjected to mechanical or corrosive stressing, then a fairly thick anodized coating is necessary and it is here that differences occur. Alloying constituents, it has been observed, give rise to clouding and discoloration of this anodized coating and so, with the thicker coatings, the polishing effect can be adversely affected. Where particularly severe demands are imposed on the appearance and adequate protection by subsequent anodic protection, only pure aluminum is satisfactory as the basis material. With regard to the anodizing stage, rolled and wrought materials are particularly suitable while drop-forged parts polish well but do not anodize so well. Dense compacted surfaces give a particularly good polish. It was mentioned that this process cannot quite replace mechanical polishing but represents a valuable amplification. The commercial applications will extend still further in the future.

### Chemical Brightening of Colored Metals

By Dr. Spaehn

The chemical brightening of brass is both of theoretical and also of practical interest. As the theory of this chemical brightening has already been adequately dealt with, the author confined himself to those points which interest the practical technician and details were given of new bath types which better fulfill the requirements for a higher polish than has been possible up to now.

Stoneware is the preferred material to use for the tank. Tanks lined with plastic have also given very satisfactory results. For exhausting the bath fumes which, at most, do not reach the extent and concentration of a copper bright dip, special plant layout attention is required. The heating of the baths can, if necessary, be done directly with immersion heaters with a ceramic protective sheath; indirect heating is also possible. The bath temperature can be chosen between 60° and 20°C. and this can be taken off the ternary diagram previously prepared by Schmid and Spaehn. The dipping duration ranges from 2

to 20 minutes, depending on the bath temperature.

Tests of the surface quality attainable with the chemical brightening process have shown that, with the aid of the process, an outstanding micro-polishing can be achieved. The best results are obtained with cold-formed material. One obtains, for example, on cold-formed alpha-brass, reflection values of approximately 60% (incidence angle  $45^\circ$ ).

The process is suitable for industrial application on all parts in the following cases:

1. Objects with small, co-ordinated surfaces such as wire netting, sieves, pressed parts and particularly expanded metal, such as is frequently used for building purposes, and metal lattice work, heating elements, lighting parts, in the radio industry, etc. A particular advantage of the process for such parts is the suitability of the baths for continuous treatment.

2. Parts which, because of their sensitivity, cannot be polished by mechanical means; for example, electronic systems and certain articles of fancy jewelry.

3. Parts which scale or discolor easily. Chemical polishing can be applied with advantage if objects of brass or nickel-silver are to be subsequently plated. If bright nickel baths are used which have levelling characteristics, then an appreciable degree of quality of the surface being treated can be achieved.

The process is very economical in the cases mentioned above. In unfavorable cases where, on account of the surface characteristic of the base metal, it is necessary to remove a considerable amount of metal, the economics of the process can then only be ensured if some care is devoted to the regeneration.

In conclusion, it should be mentioned that a bath has recently been developed with which very satisfactory results can be achieved. The process works similar to the former brightening process with 2 baths. In the first bath, a pre-brightening is given for about 4 minutes at  $40^\circ$ - $45^\circ\text{C}$ . The surface then has a matt film which is removed in a second bath within 10-15 seconds with the formation of a highly brilliant surface. The advantage of this process lies in the cheapness of the pre-brightening bath. A certain disadvantage, which can be



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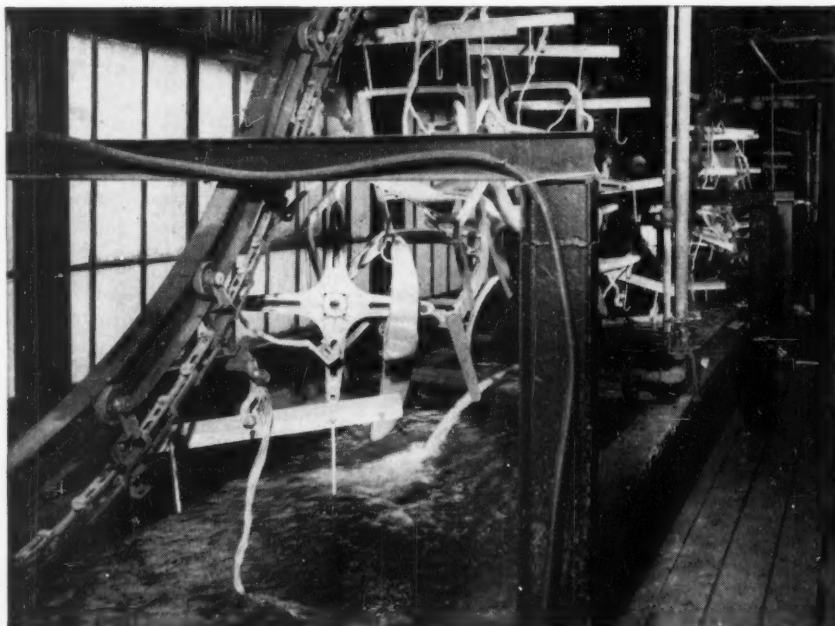
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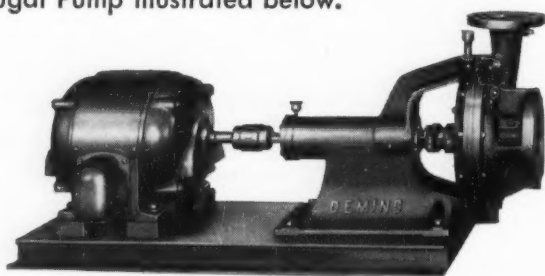
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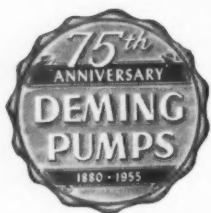
## Operation "Rinse Water"

Pictured above are aluminum parts being rinsed after taking a bath in a solution of 20% sulphuric acid. The electrochemical formation of an oxide layer on the surface of the aluminum parts (anodizing) insures a stronger finish of the subsequent plating. The rinse bath must be kept in constant circulation. This is the important job performed by the Deming Fig. 4012 Centrifugal Pump illustrated below.

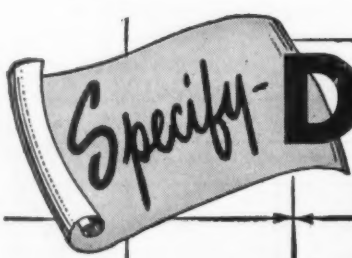


Deming Fig. 4012 (two ball bearing type) has separate liquid end construction. Only the liquid end parts need be made of corrosion-resistant alloys. This saves you money on first cost and future possible repairs.

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# DEMING PUMPS

suppressed by a correct method of working, consists in the fact that the second bath, the true brightening bath, must be maintained within narrow temperature limits in order to achieve a true high polish.

### Self-Regulating Chromium Plating Bath

*By Dr. Elssner*

In chromium plating, the metal is not present in solution as cation but as anion. By foreign acids which, to a certain extent act as catalyzers, the necessary reduction processes are made possible. By means of a series of graphical diagrams, the significance of the concentration ratios were indicated, particularly as regards the deposition potentials, types and amount; also the influences of the total concentration, the current density, and bath temperature. The amount of foreign acid added determines not only the critical minimum current density but appreciably influences the current efficiency.

The individual possibilities of control of the bath compositions were indicated. The self-regulating high speed chromium bath makes use of the limited solubility of certain salts in chromic acid solutions. While the foreign acid-ion concentration gives the maximum solubility of certain salts for the most favorable deposition conditions, the excess foreign acid is automatically removed by means of buffer action. Through this, the maximum concentration of foreign acid ions and, accordingly, the most favorable concentration ratio is affected only by the bath temperature, which can easily be controlled automatically, and by the bath concentration.

The practical bath conditions were given in individual detail. In order to be certain of achieving the maximum solubility, when starting up or after the operation of the bath has been interrupted, active stirring must be applied. Indications were given of the practical advantages of the bath and of its advantages, for example for hard chromium plating. The smoothness of the deposits obtained with this bath even with the greater coating thicknesses makes the bath suitable also for finishing tools as a saving is obtained on subsequent grinding operations. It was mentioned that the use of alternating current in the bath can

increase the throwing power. The racks need to be particularly carefully covered.

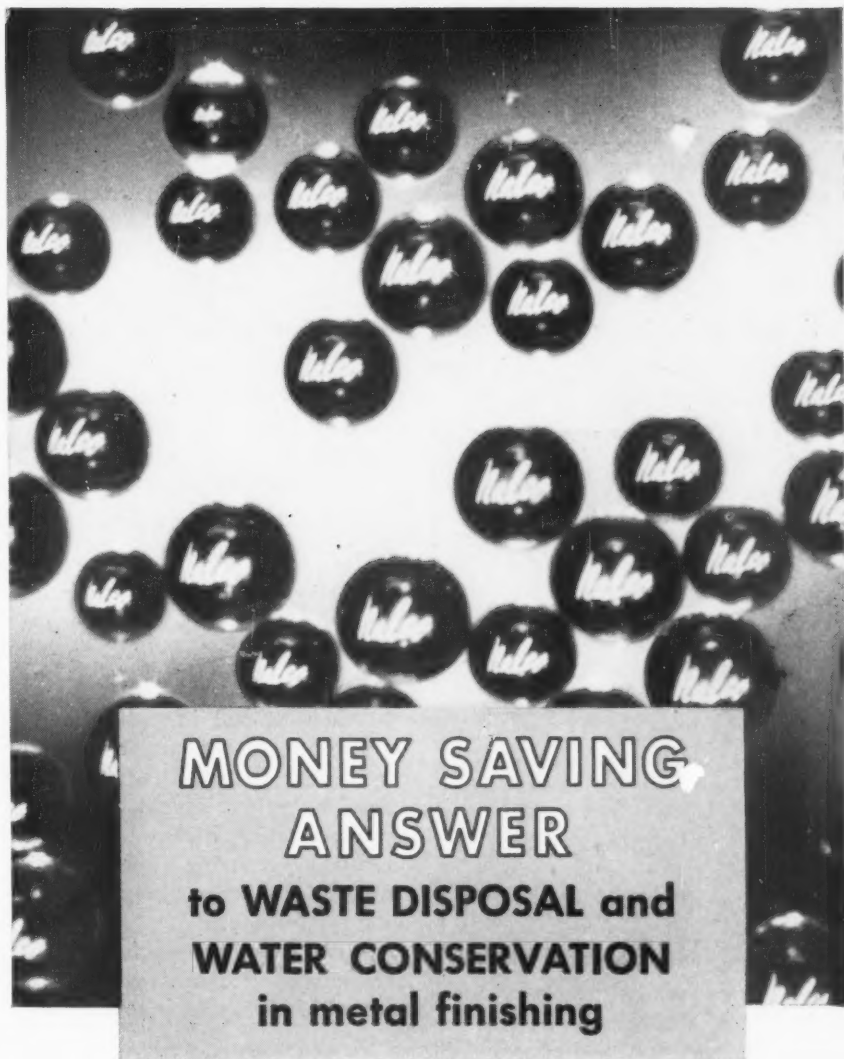
### Cold Chromium Plating Baths

By Dr. Kutzelnigg

The characteristics of the normal chromium plating processes were presented in comparison with the cold process which has now given satisfactory service for some years. Operation at normal bath temperature, the good throwing power of the bath, the current efficiency which is three times as high, the high deposition rate, the compactness of the deposit and the low hydrogen adsorption were discussed, among other advantages, and examples and numerical data were given.

A copper or brass undercoat is recommended only for plating zinc or steel, if particularly high requirements are imposed on the corrosion protective characteristics of the plate. If a nickel undercoating is given, this can be thinner than is normal. Practically all the metals which are plated in industry can be directly chromium plated with this bath without any intermediate coatings. In this way, appreciable savings in material and processing costs are obtained. Against this, the disadvantage of a subsequent polishing of the parts does not appear so prominent and, in addition, a new type bath renders the polishing considerably easier. Details were given regarding the special fields of application of this process. The structure of the coating was indicated by electron microscope pictures which also showed the effect of the polishing process.

With current densities up to 25 amp./sq. dm. the deposition rate remains below  $\frac{1}{2}$  micron/minute. The deposits are then very easily polished. Higher current densities increase the polishing costs. An outstanding feature of this bath is the high corrosion resistance of the cold chromium plated deposits. Thus, cold-rolled brass shapes, which have been previously annealed at 700°C. and then given a 4 micron thick cold chromium plate, are absolutely resistant to sea water. Good polishing results can also be obtained by an electropolishing process. The fact that it is possible to plate directly without a previous nickel plate is of great advantage with die cast zinc parts. The cold chromium deposit has very little internal stresses.



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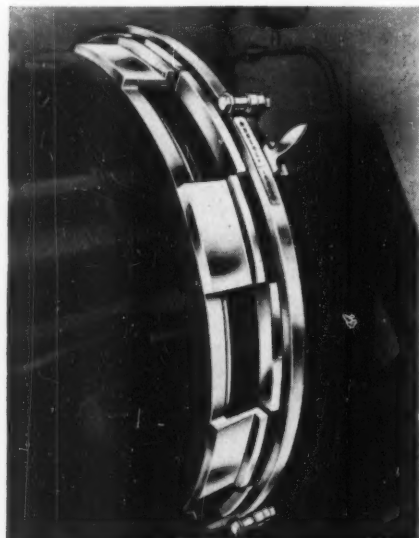
# Recent Developments

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## Speed Lock Cover for Filters

Sparkler Mfg. Co., Dept. MF, Mundelein, Ill.



The above manufacturer announces that its new Passalacqua Speed Lock Cover will be standard equipment on all Model MCR retractable tank vertical plate filters. The new, easy-to-operate safety cover is approved by ASME and has proven particularly useful for pressure vessels that require frequent opening.

The cover is locked by a series of visible bow-shaped lugs mounted on a third ring. The lugs are in direct rectangular shear. Even if one lug fails, the cover remains locked because the stress divides itself equally among the remaining lugs, which have a high safety factor. The third ring has a locking arrangement that locks in both the open and closed position. Engaging all holding devices is simultaneous and foolproof. The ring floats in roller bearings and its lugs are not under shear until internal pressure in the tank is built up. Even in a large diameter tank, the ring travels through an arc of only 15 to 20 degrees. This enables the cover to be opened in seconds, without the use of hand tools or power devices. An O-ring sealing gasket is incorporated which gives a self-seal that becomes tighter in direct

proportion to the increase in internal pressure.

The cover is fabricated and forged of high tensile strength steels.

## Industrial Skin Cream

The Stanley Chem. Co., Dept. MF, East Berlin, Conn.

A new skin cream keeps industrial workers' hands clean while they work, and free from cracking and chapping afterwards, its makers say.

When rubbed into the hands, the cream provides a protective film before working with oil, grease, paint, varnish, printer's ink, lacquer, solvents, gasoline, kerosene, naphtha—or virtually anything not soluble in water. The cream keeps these substances from actually coming in contact with the skin. After work, the cream and accumulated dirt wash off easily with soap and water.

Recommended by insurance companies, Hand Save also saves using expensive and possibly dangerous solvents in washing up.

## Zinc Bright Dip

The Chemical Corp., Dept. MF, Springfield, Mass.

The above manufacturer has announced the addition to its line of Luster-On M a new, quick one dip brightening treatment for zinc. The material is used in very dilute 2% solution to give a bright, attractive finish with good corrosion protection.

## Cleaning Machine

Magnus Chemical Co., Inc., Dept. MF, Garwood, N. J.

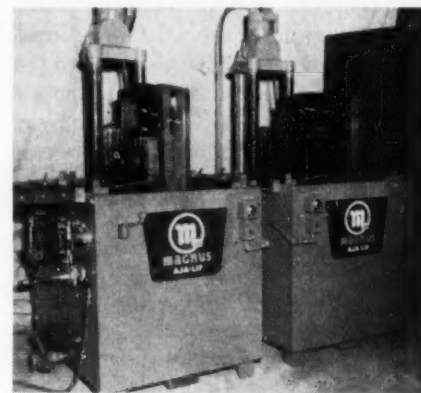
The above manufacturer announces a new addition to its line of mechanically agitated cleaning equipment.

The new Aja-Lif cleaning machine with "gyro-vertical motion" is equipped with a work carrying platform combining rotary motion with vertical up and down agitation. At the

same time as the work is moved up and down 120 vertical motions per minute, it is slowly rotated through a complete 360° circle. Oils, loose chips, castings and similar industrial soils are said to be quickly and easily removed from intricate castings such as journal boxes, motor blocks, etc. Already it has replaced expensive manual scrapping and rodding at a leading manufacturing plant.

The work to be processed can be transported to the equipment on the plant roller conveyor. The operator secures the casting on the revolving platform using the adjustable hold down device which keeps the work in position during the combined rotation and up and down agitation.

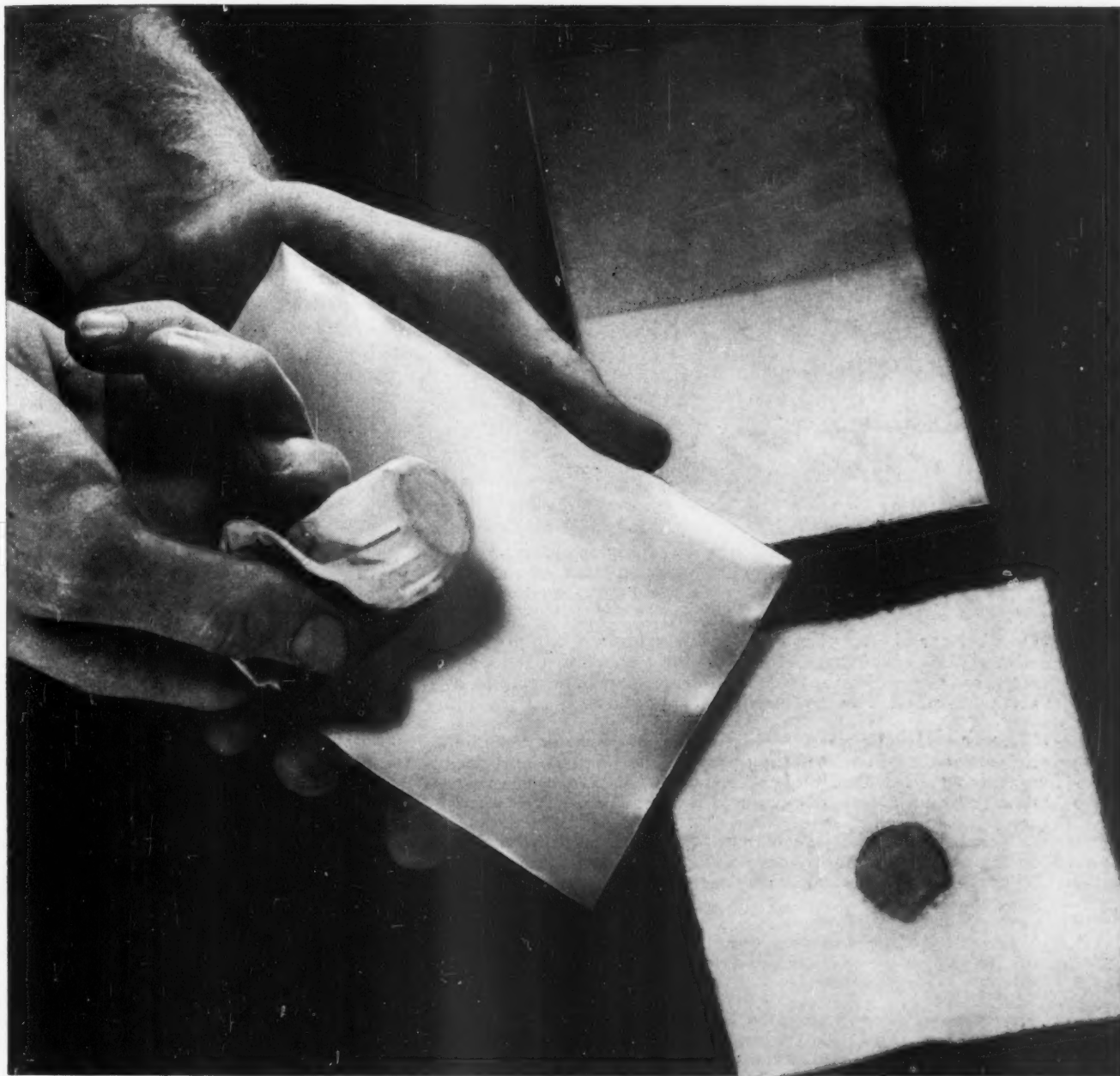
The operator then moves the agitating lever which causes the platform to lower in the solution where it immediately starts its fast cycle of up and down vertical agitation. Then the revolving platform starts to rotate.



After completion of the washing cycle, the platform is raised to unloading position. The rotation of the work continues for a few seconds to completely drain all liquids from inside recesses of the part being cleaned. The hold down device is released and the operator transfers the work to the rinse machine where the process is repeated.

The machine requires no special foundation and can be installed in any existing production line.





Cloth on table reveals gloss-killing smut left on steel panel by old-style electrocleaner. Cloth in plater's hand shows virtual absence of smut on K-8-cleaned panel, assuring glossy, smooth plate.

## New K-8 beats other electrocleaners in smut-removal tests!

The steel panel in the plater's hand has gone through a Pennsalt K-8 electrocleaning bath. The other panel underwent a similar cycle with a competitive cleaner. After electrocleaning, the bottom half of each panel was rubbed with a clean cloth in the manner shown.

The evidence in favor of K-8 is indisputable. Smut remaining after K-8 cleaning is almost nil, whereas the panel cleaned in solution "X" yields considerable smut—enough smut to cause plating rejects.

Where other cleaners fail, K-8 delivers consistently brilliant results—minimizing costly extra buffing, roughness and streaking of the plate. The use of K-8 *cuts rejects to the bone*. K-8 combines *synergistic* surfactants and highly conductive alkaline detergents; maximum current flows with low voltages.

Your Pennsalt service man will gladly demonstrate K-8 in *your* plating cycle. Call him or write to Metal Processing Department,

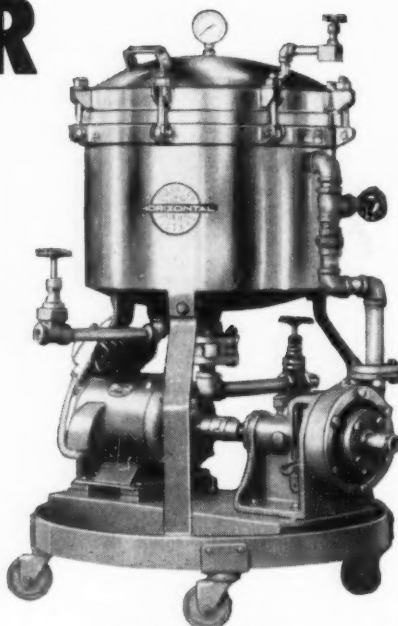
Pennsylvania Salt Manufacturing Company. EAST: Three Penn Center Plaza, Philadelphia 2, Pa.; WEST: Woolsey Building, 2168 Shattuck Avenue, Berkeley 4, Calif.



**A BETTER START FOR YOUR FINISH**

# SPARKLER HORIZONTAL PLATE FILTERS

**FOR LOW COST FILTERING  
OF PLATING SOLUTIONS  
AND CARBON TREATMENT  
WITHOUT SHUT DOWN  
HERE'S HOW**



Sparkler Plating Filter  
Model 18-D-6 Alliron  
600 G.P.H. Portable

On a horizontal filter plate it is possible to apply a thin pre-coat with about one-third the filter aid, and in one-third the time required for pre-coating a non rigid media or a surface in a vertical position. This saves time and filter aid.

Where several tanks are to be filtered, the Sparkler filter can be shut down after filtering the first tank and moved to the next one without danger of disturbing the filter cake. This saves pre-coating time and filter aid usually required to re-coat a bag-type filter.

A filter cake on a horizontal plate will not crack, slip or fall off even with varying pressure or a complete shut-down of the filter. No pre-coat renewal is ever required after an interruption in operation.

When it is necessary to clean the filter, the Sparkler filter tank can be emptied in a matter of minutes with a minimum loss of valuable plating solution.

Any grade of filter paper from fine to coarse can be used in a Sparkler filter. This makes it ideal for carbon treatment of solutions. Carbon mixed with water in a stand-by tank is circulated through a clean set of filter paper on the plates until a carbon cake is formed. The solution requiring carbon treatment is then circulated through the carbon beds without contaminating the plating tank or a shutdown of plating operations.

At the end of the cycle with a Sparkler filter you can blow-down with air and produce a relatively dry cake that can be disposed of in a trash can rather than washing it down the drain with attendant sewer clogging problems.

You will find your Sparkler plating filter positive and dependable from a standpoint of uniform high quality filtering and economical in labor and material.

Write Mr. Eric Anderson  
for personal service.



**MANUFACTURING COMPANY**  
Mundelein, Illinois

SPARKLER INTERNATIONAL LTD.  
Canadian Plant, Galt, Ontario  
European Plant, Amsterdam, Holland

Sparkler representatives in all principal cities are ready to give you personal service on your filtering problems, and show how you can make a material saving in operating cost.

## Cold Cleaners

*Manufacturers Processing Co., Dept. MF, 1360 Hilton Road, Detroit 20, Mich.*

It is claimed that this new line of Manpro cold cleaners is made up of fast drying, non-toxic and non-flammable chemicals suitable to a variety of metal cleaning operations. The No. 20 cleaner is said to be excellent for machinery wash-down, particularly electrical items because this cleaner is said to be a non-conductor.

Another cleaner designated as No. 21 has no flash or firepoint and, therefore, is pointed out as being equally efficient in operations formerly reserved for toxic and flammable solvents in cleaning and degreasing small parts.

For wipe-down on process equipment, the No. 22 cleaner is said to include such advantages as low volatility and low dermatitis incidence. It has found acceptance in soaking of small metal parts as well as cleaning of heavy machinery. The No. 23 cold cleaner is claimed to be especially suitable for the cleaning and degreasing of electric motors, generators, controllers, and other electrical components in closed circuits.

## Antiseptic Hand Soap

*The Chemical Corp., Dept. MF, Springfield, Mass.*

A new Kemsuds product, Platinum Balm is an antiseptic powdered hand soap and stated to contain a graded, safe all vegetable scrubber particularly formulated for women in industry. It also has a very high percentage of beaded Ivory soap and a large quantity of emollient which offers protection from chapping in cold weather leaving the skin soft and smooth. In addition, it contains lanolin and G-11 (Hexachlorophene). The latter helps protect both men and women workers against skin infection and helps prevent contamination of the materials they handle.

The material is packed in 5-pound boxes, 12 to the case and 200-pound barrels.

## Compounds for Barrel Finishing Zinc

*Esbec Barrel Finishing Corp., Dept. MF, 18 Beech St., Byram, Conn.*

Two new barrel finishing compounds have been announced, which

the makers state will produce phenomenal results on zinc die castings.

No. 655 is a mild abrasive compound which produces ultra smooth surfaces in surprisingly short cycles and rinses completely at the end of the cut down run. This is followed by a short burnishing cycle in No. 205 burnishing compound which, the makers state, will produce ultra high luster on all types of zinc alloys.

In many cases, where parts are being prepared for plating, ball burnishing can be eliminated by merely lengthening the honing cycle with No. 205.

For ultimate in color and luster, however, the parts should be run in No. 205 with hardened steel balls or other burnishing media.

### Packaged Water Softeners

Hagan Corporation, Dept. MF, 323 Fourth Ave., Pittsburgh 22, Pa.

A new line of water softeners for manufacturing plants, institutions, and commercial establishments, are sold as package units, so that only simple connections, requiring a minimum of installation time, are needed to fit a unit into a water system. A supply of Resin C-300, a high capacity resinous exchange material, is provided with each.

Each unit consists of a brine tank and a softener tank, with their controls and piping in place. Twin units, which include two softener tanks with a single brine tank, also are available. With a "twin," one tank is always on the line to supply soft water while the other is being regenerated.

Flow rates can be as high as 175 gallons per minute for a single unit, or 350 for a twin, with capacities between regenerations ranging up to 1,500,000 grains for a single unit and 3,000,000 grains for a twin. A typical "hard water" may contain from 5 to 15 grains per gallon.

In the softener tank, the exchange material rests over a bed of gravel. As raw water passes through the tank, the calcium and magnesium salts, which cause "hardness," combine with the exchange material, so that the water that leaves the tank is softened. When the resin becomes saturated, it can be regenerated quickly by use of an ordinary salt solution, drawn from the brine tank into the softener tank.

Each softener tank is equipped with a simple but effective backwash auto-

# now

you can get this  
brilliant finish  
directly on  
zinc die castings!

No electroplating--no  
mechanical finishing!



PART AS CAST



TREATED WITH NEW IRIDITE

## NEW

# IRIDITE® (Cast-Zinc-Brite)

brightens zinc die castings by chemical  
polishing, protects against corrosion

**NOW, FOR THE FIRST TIME** you can get a brilliant, decorative finish directly on zinc die-cast parts . . . without mechanical finishing, without electroplating! The luster is provided by the *chemical polishing* action of new Iridite (Cast-Zinc-Brite) solution. Even surface blemishes, such as cold shuts, are brightened by this new process. No electrolysis. No special equipment. No specially trained personnel. Just a simple chemical dip for a few seconds and the job is done. And, this new Iridite has been *tested and proved* in production.

**CORROSION RESISTANCE, TOO!** New Iridite (Cast-Zinc-Brite) provides exceptional corrosion resistance for bright-type chromate finishes . . . also guards against blueing or darkening by eliminating zinc plate formerly required in bright chromate finishing of zinc die castings.

**AS A BASE FOR ELECTROPLATING**—Lower mechanical finishing costs are possible where plated finishes are *required* since the brightness provided by this new Iridite may be sufficient.

**LET US SHOW YOU** what Iridite (Cast-Zinc-Brite) can do for you. Send us at least a half-dozen typical zinc die-cast parts for **FREE PROCESSING** for your own tests and evaluation. Or, for immediate information, call in your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified 'phone book. **IMPORTANT:** when you give us samples for test processing, please be sure to identify the alloy used.

Iridite is approved under government specifications.

## ALLIED RESEARCH PRODUCTS

INCORPORATED

4004 06 E. MONUMENT STREET • BALTIMORE 5, MD

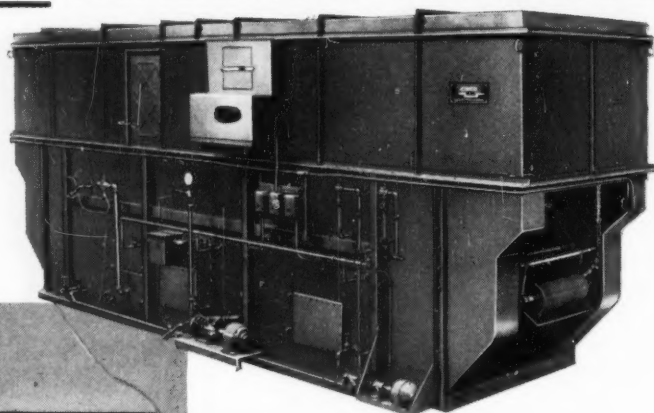
Manufacturers of Iridite Finishes for Corrosion Protection and Paint Systems on Non-Ferrous Metals; ARP Plating Chemicals.





# Scrubs out the last speck of **DIRT** **CIRCOSONIC ULTRASONIC DEGREASER**

Typical Circo conveyor type vapor degreaser with integral ultrasonic chamber.



**... Low frequency Transducers make the difference!**

Use Circosonic whenever cleanliness must meet stringent industrial or military standards. New transducer operates at lower frequency which cuts shadow effect so that ultrasonic waves curve around corners . . . remove every last speck of oil, grease, lapping compound and dirt from deepest recesses and capillaries as no other method can do. New shape beams sound energy

over wider area . . . requires no critical positioning when cleaning small parts like bearings and electronic components . . . extends to any desired length for large shapes like transmission pumps and gears. Circosonic units provide new standards of cleanliness while cutting cleaning time from hours to seconds . . . may also be integrated into existing cleaning equipment.



130 Central Avenue, Clark (Rahway), New Jersey      Offices in principal cities  
PER-SOLV (Perchloroethylene)      CIRCO-SOLV (Trichloroethylene)  
Vapor and Ultrasonic Degreasers • Metal Parts Washers • Dryers • Solvent Recovery Stills

## MANY STANDARD MODELS . . .

Units from 500 watts to 25 kw. Available separately or integrated with Circo Vapor Degreasers, conveyorized or hand operated. All backed by nationwide technical field service.

**YOUR INQUIRY BRINGS** complete ultrasonic technical data . . . plus authoritative 32-page Vapor Degreasing Manual. No obligation, of course.

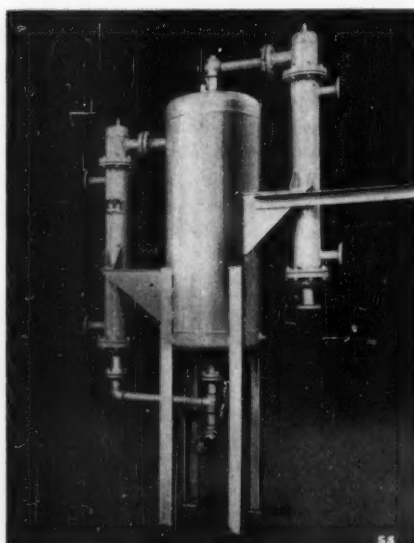
matic controller that accurately maintains the correct flow of water through the unit during backwash, preventing loss of resin, but insuring sufficient flow for adequate cleansing of the exchange material.

Fine slot, non-clogging distributors made of brass are mounted near the bottom of the tank. By their construction and placement they insure even flow of water and prevent loss of resin. A positive-seating multiport valve and two pressure gauges are also included in the equipment of each softener tank.

## Solvent Still

Process Equipment Dept., Struthers Wells Corp., Dept. MF, Warren, Pa.

A solvent reclaiming still, designed

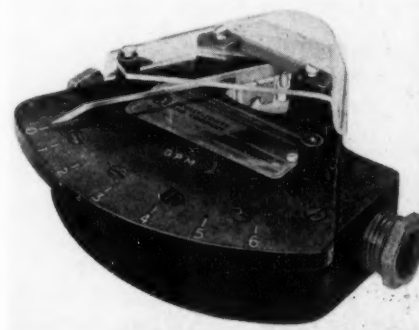


to eliminate impurities in solvents and allow their re-use, is available for either batch or semi-continuous operation. The still is made in five standard sizes in capacities to 300 gallons per hour. The heating medium is steam, with water required for use in the solvent condenser.

The still ordinarily is constructed of carbon steel, but it can be supplied in stainless alloys and non-ferrous construction. Design is based on standard stock parts, permitting quick shipment.

## Flowmeters of Direct Flow Design

Instruments Division, Scully-Jones and Co., Dept. MF, 1901 S. Rockwell, Chicago 8, Ill.



Model "L"

Two new indicating flowmeters that feature direct flow through the meter chamber have been announced.

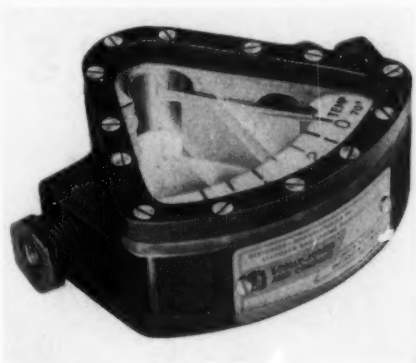
Direct flow design keeps the housing clean, and flexing of the vane in operation prevents any accumulation of scale or sludge. The basic design improvement made in these instruments is the flexible vane riveted to the body at one end, leaving the other end free to traverse an arc equal in length to the calibrated scale. A horse-shoe section of the flexible vane permits the necessary motion under flow, safely within the elastic limits of the vane. This design eliminates completely delicate component parts such as pivots, bearings, bellows, diaphragms, glass tubes, floats, etc.

On the Model "L" flowmeter a pointer accurately indicates the position of the vane over a calibrated scale. This pointer is coupled to the vane magnetically, thus eliminating packing glands, blind bearings, and leakage possibilities. A plastic scale enclosure keeps the instrument clean and readable under almost any operating conditions. Because there is no

communicating shaft between the meter flow chamber and the outside, high pressures do not introduce friction due to vane shift or cause lag in the pointer. The scale is approximately uniform.

The Model "LP" is a companion instrument to the Model "L" and is designed with a transparent cover to permit viewing the liquid or gas flow. This feature is very important where color changes occur in the fluid to indicate oxidation, contamination, waste pick-up or changes in concentration.

Flow is measured by the same type of flexible vane used in the Model "L" except that attached to the vane is a highly polished pointer segment that



Model "LB"

travels beneath the plastic cover and indicates the flow rate. The brightness of the pointer and its proximity to the transparent cover make it easy to see in very dense colored fluids or gases.

Accessories are available for the instruments such as: built-in turn cocks to regulate flow; externally mounted mercury stem glass thermometers. The Model "LP" can be built for any pressures that are considered safe for the transparent covers (as great as several thousand pounds at moderate temperatures).

#### Palm-Coated Jersey Gloves

*The Pioneer Rubber Co., Dept. MF, 296 Tiffin Rd., Willard, O.*

As a direct result of the enthusiastic reception accorded last year's introduction of its improved Stanflex work glove, the company has added two new models to the line: The palm-coated knit wrist type, illustrated, and a 10-inch band top style, also palm coated. Both gloves have been carefully designed to allow more than 47 sq. inches of seam-free work surface, which means that seams are completely eliminated from abrasion

## MAINTENANCE COSTS



When you insulate with

## TYGON 277

*Air-Dry* RACK COATING

This new "higher-solids-content" rack coating builds up a thickness of five mils per dip — four easy dips instead of the seven usually needed to build a safe 20 mil coat — cuts rack handling time almost in half. This higher-solids-content means a denser, less porous coating, — safer, more efficient, longer-lasting protection.

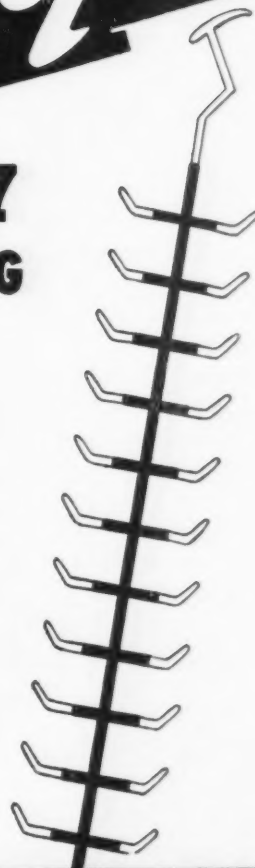
Tygon 277 requires no primer, it is self-adhering; requires no baking, it air dries quickly; requires no laborious application techniques, just dip and air-dry—that's all.

Place a trial order for a gallon today. Check it against the best you've known. You'll go Tygon 277 all the way.

Plastics and Synthetics Division

# U. S. STONEWARE

AKRON 9, OHIO



2740

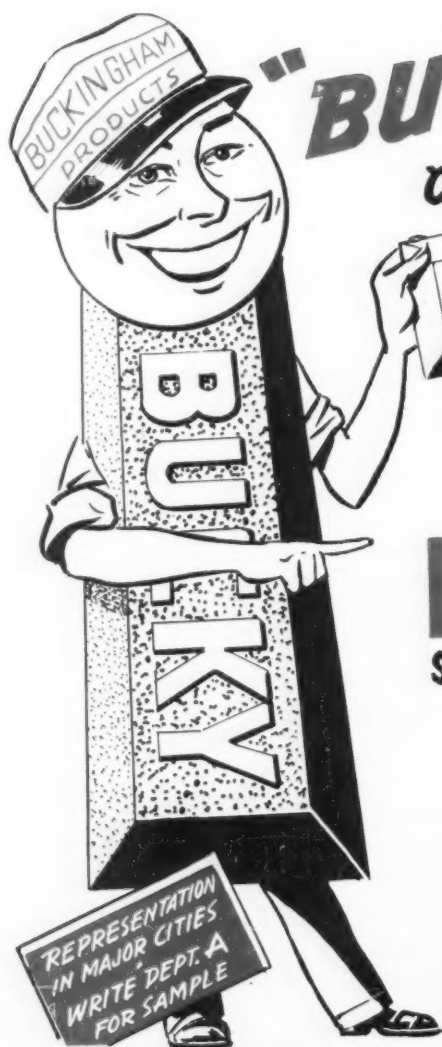


points. The specially-compounded plastic coating offers a non-slip satin finish which actually outwears leather gloves.

#### Chip Bins

*Lord Chemical Corp., Dept. MF, 2068 S. Queen St., York, Pa.*

Lorco two-compartment bins to hold aluminum oxide chips for barrel tumbling are furnished with gates that assure, positive control of the chip flow. Each gate is raised outwardly in a short arc from the wall of the bin so that the action of gravity will prevent any chips from interfering with the closing of the gate. The entire



**"BUCKY"**  
*offers you*

**FREE!**

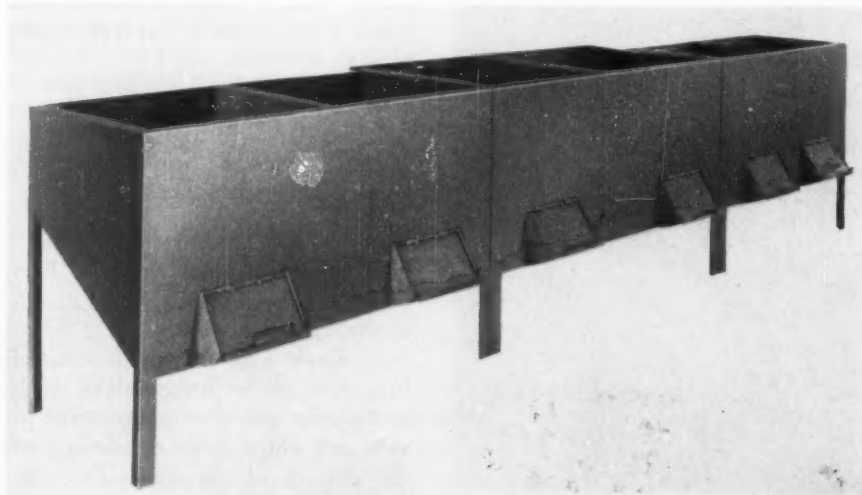
a TRIAL BAR  
of  
**K260 G**  
STAINLESS STEEL  
BUFFING  
COMPOSITION

OUTSTANDING FOR  
CUT AND COLOR  
WHEN USED WITH  
**SISAL BUFFS**

*The* **BUCKINGHAM PRODUCTS CO.**  
**POLISHING and BUFFING COMPOSITIONS**  
14100 FULLERTON AVE. DETROIT 27, MICH.

gate assembly is replaceable when worn.

The bins are furnished in three sizes:



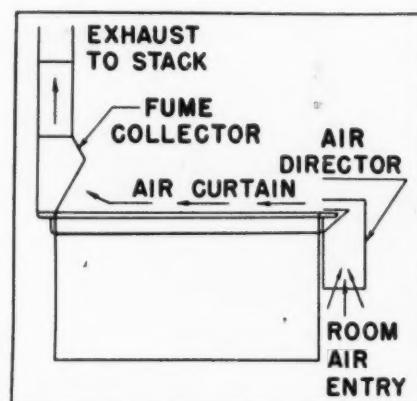
No. 2B-22 has two compartments, each having a volume of 22 cu. ft. Each compartment will hold approximately 1,400 lbs. of chips; total capacity of bin 2,800 lbs. Floor space occupied by bin is 25 by 48 in.

No. 2B-30 has 32-cu.-ft. compartments, each holding approximately 2,000 lbs. of chips; total capacity, 4,000 lbs. Floor space, 31 by 56 in.

No. 2B-40 has 40-cu.-ft. compartments, each holding approximately 2,600 lbs. of chips; total capacity, 5,200 lbs. Floor space, 36 by 60 in.

#### Fume Removal System

Heil Process Equipment Corp., Dept. MF, 12901 Elmwood Ave., Cleveland 11, O.



New pre-engineered Air-Saver fume removal systems (push-pull type) provide many design and cost advantages in ventilating plating, anodizing, and pickling tanks. Systems consist of a collector or exhaust hood for removing fumes, and a director for supplying a current of air at proper velocity to direct the fumes into the collector hood. The director, a compact air supply unit, containing its own motor and blower, will furnish an even air current across a tank surface so that tanks as wide as six feet can be properly ventilated.

The above manufacturer claims that this system will save heat, as fume removal rates can be reduced up to 75%, thereby minimizing room heat losses. Savings in power are effected as smaller fans are required. Reduced initial costs are obtained, since smaller ducts and stacks can easily handle reduced volume of fumes to be removed.

The systems are available in either solid Rigidon plastic, steel, or steel lined or coated construction. They are easy to install, and are supplied in convenient pre-engineered standard

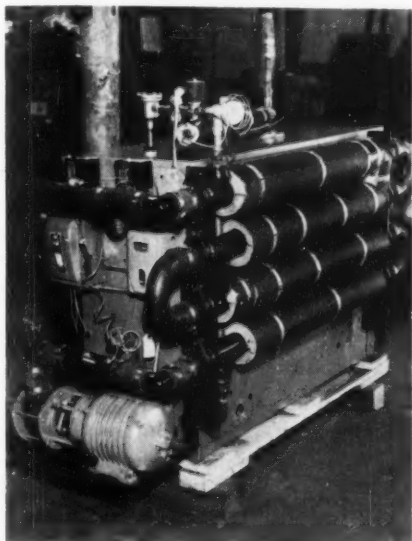


sizes, with up-draft or down-draft collector hoods. Complete package units will afford the best fume removal system for new installations. In present installations, where hoods are not functioning as desired, or required, the addition of an Air-Director will improve the ventilating conditions.

#### Refrigeration Unit

Carl Buck & Associates, Dept. MF, Essex Fells, N. J.

Illustrated is a complete refrigeration unit for cooling sulphuric acid anodizing solution. Pump is of Camac Furacam plastic and heat transfer



tubes of Karbate. These units are available in all sizes to do any solution cooling job.

Materials of construction include Karbate, plastics, steel and stainless to provide a complete pump and exchanger unit of proper materials to resist attack by any solution. Unit can be furnished complete with necessary controls to hold solutions at any desired temperature.

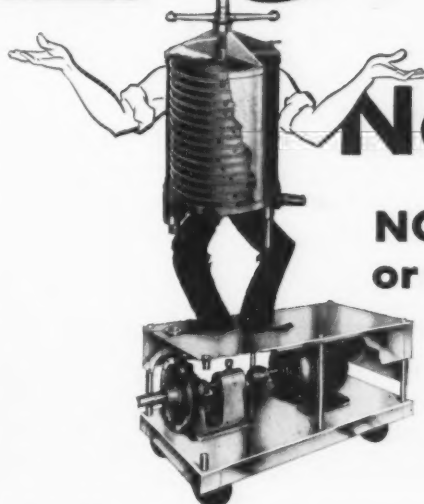
Standard price and capacity sheets are available on request from the above manufacturer.

#### New Device for Effective Backwashing

Graver Water Conditioning Co., Dept. MF, 216 W. 14th St., New York 11, N. Y.

A new and effective method of combatting certain backwash difficulties occurring in filtration and ion exchange materials is a sub-surface washer, claimed to be successful in demineralizers, zeolite softeners and filters experiencing excess fouling of

# LOOK

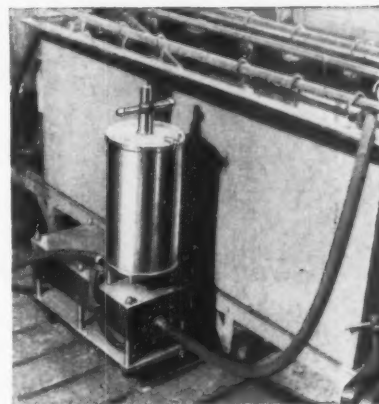


## No Rejects

**NO pitting, spotting, or reworking . . . . .**

Impurities — primary cause of pitting, spotting, rejected finished work — are positively eliminated by the Alsop "Sealed-Disc" Filter. That's because they're designed for Platers — to meet plating room requirements. That's why they're compact, portable, smaller than conventional filters—save valuable space—yet capable of handling equal volumes of solutions.

Simplicity of design cuts operating time and labor — means savings for you. Check its many additional proved performance features and know why more platers depend on "Sealed-Disc" Filters. Ask your regular plating supplier — or write for details.



"Sealed-Disc" Filters remove more impurities with less effort and in less time. Use it on your acid dips, cleaners, and solvents too.

## ALSOP

ENGINEERING



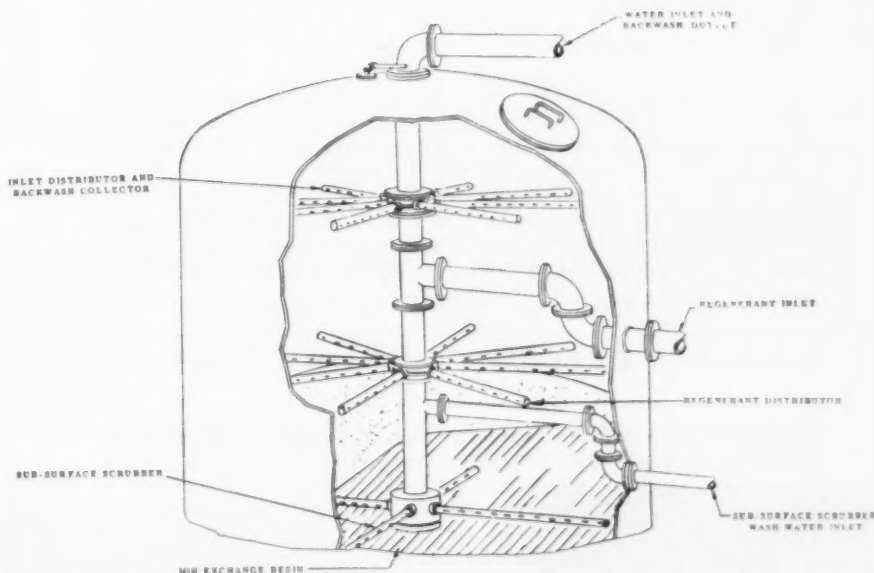
CORPORATION

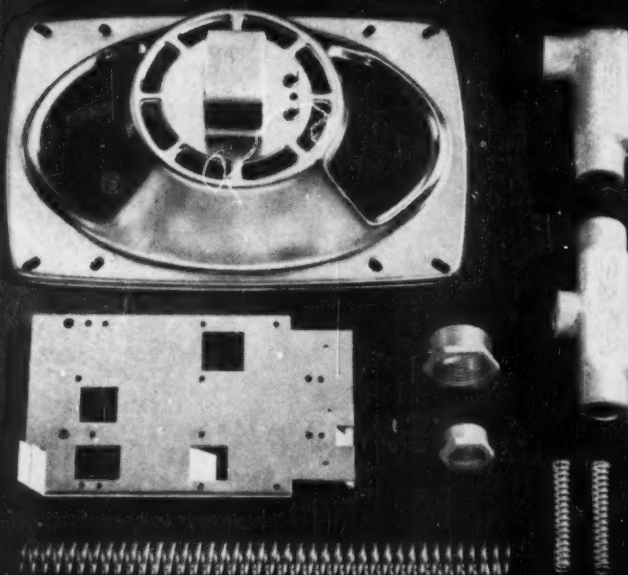
## Positive Filtration

FIRST STEP IN CUTTING COSTS

1012 BRIGHT STREET

MILDALE, CONNECTICUT





## A FINER CADMIUM PLATING PROCESS

### *Udylite Bry-Cad Process Gives the Faster and Brighter Cadmium Finish*

Newly developed by Udylite research, Bry-Cad offers many interesting applications for cadmium plating.

**Springs**—Bry-Cad provides excellent protection with a minimum of hydrogen embrittlement.

**Electronic Assemblies**—Bry-Cad's low electrical contact resistance is highly desirable on assemblies put together with fasteners. An excellent surface for rapid soldering.

**Malleable Iron Castings**—Bry-Cad gives unusual coverage not obtainable with similar rustproofing finishes.

**Stainless Steel Aircraft Parts**—Bry-Cad does not cause embrittlement of stainless steel parts subjected to high temperature.

Udylite Bry-Cad has other advantages such as: High cathode efficiency, simplicity of operation and control, attractive finish with less tendency to finger mark, a self-lubricating metal and good resistance to mild alkalis. Bry-Cad is easily adapted to plating in barrels, hand operated tanks, semi-automatics or full automatic machines.

The Udylite Bry-Cad process is just one of the many electroplating processes pioneered by Udylite. Whether your need is for a process, equipment or supplies—be sure to consult your Udylite representative or fill out coupon and mail to us direct.

## WORLD'S LARGEST PLATING SUPPLIER

Please have a sales representative call on us concerning Udylite's Bry-Cad plating process. Have him ask for:

THE  
**Udylite**  
CORPORATION  
DETROIT 11, MICHIGAN

NAME \_\_\_\_\_  
COMPANY \_\_\_\_\_  
STREET \_\_\_\_\_ ZONE \_\_\_\_\_  
CITY \_\_\_\_\_ STATE \_\_\_\_\_

beds. Many waters not turbid enough to justify clarification still contain enough soluble solids to plug softeners and filters. In such cases ordinary surface washing devices become inadequate and proper backwashing is hindered. Difficulties of this sort can be encountered in many demineralizing and ion exchange installations.

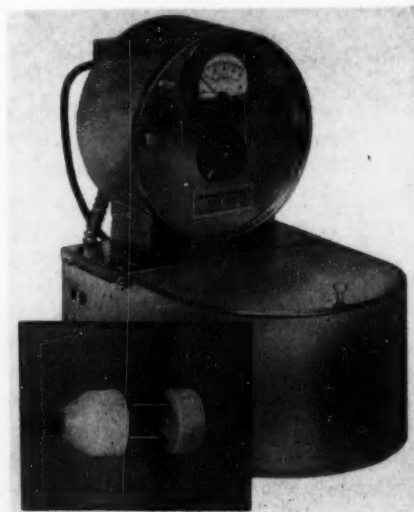
Physical fouling of ion exchange and filter beds can result from one of three causes: (1) dense precipitates which must be broken into finer particles for removal by normal backwashing rates; (2) sticky precipitates which cause filter and ion exchange particles to form large lumps—short circuiting backwash water; and (3) fibrous materials which form a matting on the surface of the bed.

In all three cases channeling and short circuiting will result in the beds unless the obstructing solids are broken up and removed. Attempts to accomplish this by using excess backwash rates will cause loss of ion exchange material as well. Wherever it has been needed the sub-surface scrubber has been most successful in breaking up these solids, preventing bed fouling, and permitting effective backwashing at normal rates, according to the company.

### Electrode Cell for Use in Solution Control

*The Diversey Corp., Dept. MF, 1820 Roscoe St., Chicago 13, Ill.*

A new system is said to improve efficiency of conductivity measurements in solution control. A newly designed electrode conductivity cell immersed in the solution or tank transmits impulses to an electronic control and feeder unit. This unit constantly



measures solution strength and feeds chemicals only when required, maintaining the solution at an even, predetermined strength.

The heavy duty electrode cell is made of stainless steel and polyethylene. The above manufacturer reports extra long lead-in wire simplifies installation in hard-to-reach places. The control circuit and feeder unit is constructed of heavy duty stainless steel, and combines laboratory accuracy with durability for in-plant use. The conductivity meter measures in milliamperes, which may be interpreted in oz./gal. or per cent concentration.

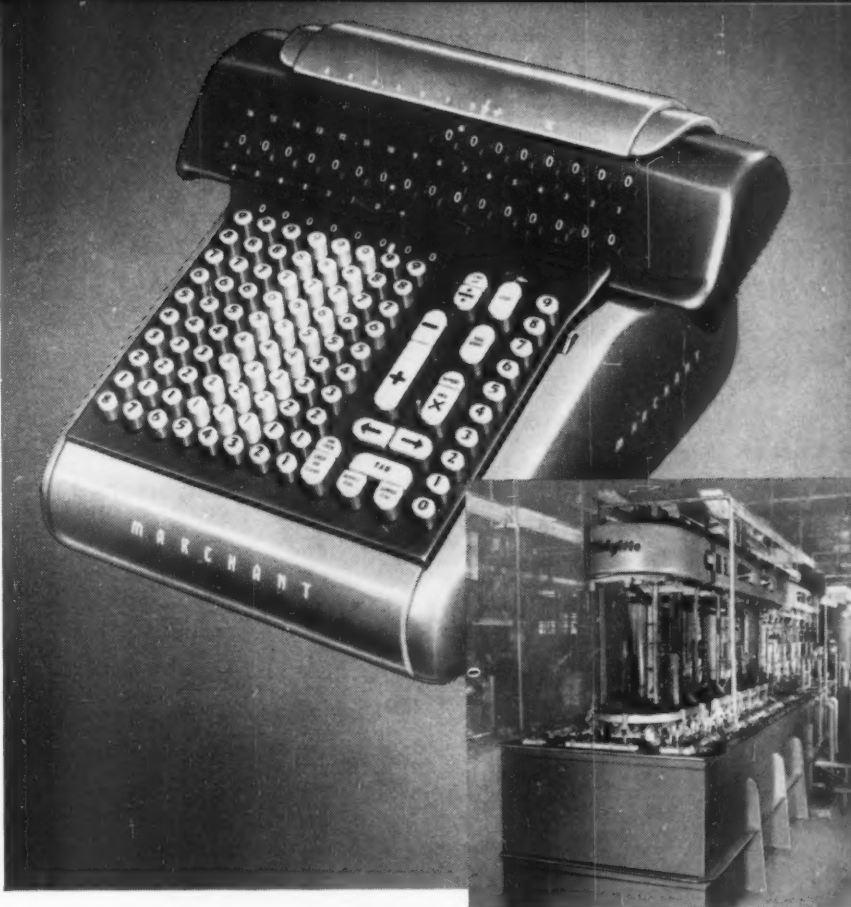
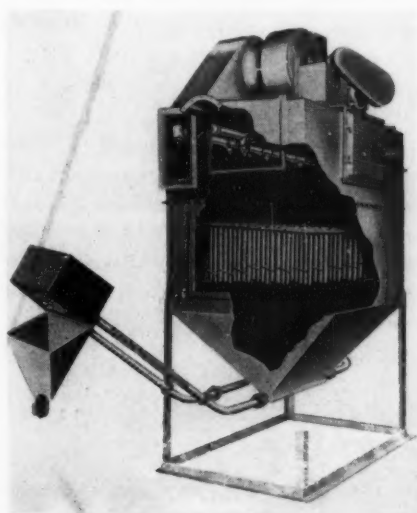
Use of the new electrode cell with control unit is claimed to make a versatile unit for all conductivity and solution control applications. It is adaptable for use in chemical processing, acid or alkali solutions, metal cleaning and plating, phosphatizing of metals, fume collectors and varied water treatment processes.

#### Fume Scrubber

*The Johnson-March Corp., Dept. MF, Philadelphia, Pa.*

A special new dust control unit is claimed to remove microscopic solids, fumes and odors from exhaust gases at 99% efficiency. It can be used anywhere impurities are encountered of extremely low and even sub-micron size particles.

The new unit, known as the Type A Hydro Precipitator Scrubber, collects dust by hydro-compressing exhaust gases through a system of multiple tubes into a water chamber. This produces a highly efficient scrubbing action. The violent water agitation set up causes secondary pressure turbu-



## MARCHANT GOES AUTOMATIC IN PLATING

### *Udylite Automatic Plating Machine Brings Big Savings to Calculator Maker*

The same benefits Marchant Calculators, Inc., enjoy from the installation of a Udylite automatic plating machine can be yours—and for only a modest capital investment.

Better process control, reduction in operating and maintenance costs and improved work quality are the result of Marchant's installation of a Udylite Junior Full Automatic. In addition, they are now experiencing better ventilation, better and safer working conditions, manufacturing control with built-in instrumentation, greatly reduced materials handling and a minimum of rejects.

When the time came to install new plating facilities for their expanding business, Marchant naturally turned to Udylite. After a study of the Marchant problem Udylite engineers recommended the Udylite Junior with an automatic load and unload conveyor for the cadmium plating to fine tolerances of the many parts of the Marchant Calculator.

And so, another business friendship has been formed.

We at Udylite can help you improve quality and save money in your metal finishing operations. For quick response fill in the coupon below.

#### WORLD'S LARGEST PLATING SUPPLIER

We are interested in Udylite Automatic Equipment for our metal finishing operations. Have your salesman call.

NAME \_\_\_\_\_  
COMPANY \_\_\_\_\_  
STREET \_\_\_\_\_ ZONE \_\_\_\_\_  
CITY \_\_\_\_\_ STATE \_\_\_\_\_

THE  
**Udylite**  
CORPORATION  
DETROIT 11, MICHIGAN



# WHAT KILLS YOUR PUMPS?

## CORROSION...ABRASION...VIBRATION?

Heavy rubber or special linings molded in the case to resist corrosion and abrasion

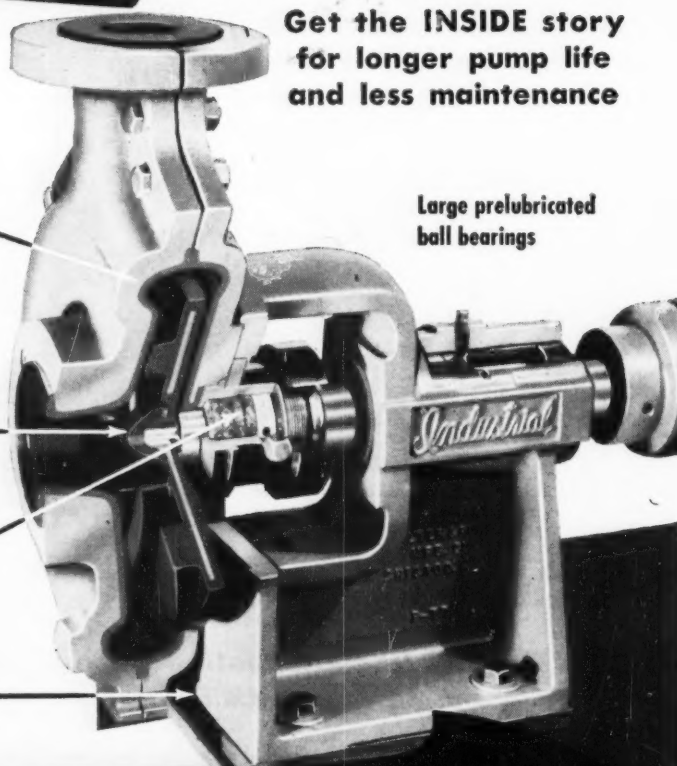
One-piece molded impeller and oversized shaft prevent oscillation

Easy access to corrosion-proof stuffing box

Rubber covered base

Get the **INSIDE** story for longer pump life and less maintenance

Large prelubricated ball bearings



# Industrial

## RESISTS ALL 3

**Lined to suit the job . . .** the rubber formula most resistant to the fluids you handle can be supplied by INDUSTRIAL'S rubber compounding and lining division. Neoprene, Saran, Hypalon and Hycar are also available. INDUSTRIAL'S experienced chemists and engineers will help you select the ideal lining and pump size.

*'Wide range of sizes available with capacities to 450 gpm.*

**Write for 8-page bulletin with head, GPM and efficiency graphs.**

lence and additional scrubbing action in the tube chamber.

The scrubber comes in 15 sizes for capacities ranging between 500 c.f.m. and 40,000 c.f.m. Sludge can be removed constantly or intermittently by manual, hydraulic or mechanical means.

Dust-laden gases can be pre-wetted and pre-cooled in the plenum or entry chamber. This, plus the constant recirculation of water, makes it possible to operate the scrubber at high temperatures.

Constant flushing of the interior prevents build-up of solids on internal surfaces and components. There are no moving parts to maintain or replace. The unit's self-cleaning characteristics and the absence of moving parts thus assure low maintenance and minimum operating costs.

Water consumption is low because the scrubber operates on a recirculating system, and makeup water is controlled automatically. Any unit in the series can be installed either indoors or outdoors.

The scrubber is designed for durability, with basic variations for size change. It consists essentially of a rectangular shaped housing containing a plenum chamber, a multiple-tube section, water tank underneath the housing, a dewatering filter and an exhaust fan mounted on top of the housing.

It is a completely self-contained unit with walls, top and bottom of steel construction. When required, it can be built with special metals or plastic materials for service with corrosive or toxic gases.

The nine smallest models are furnished completely assembled for quick and easy installation. The six larger units are supplied in two or three sections for shipping and handling ease. Each section is complete in itself and simple to erect with its mating section or sections.

Each scrubber is equipped with two or more inspection doors and a watertight inspection window in the tube chamber. Built-in fans are included with the 12 smallest units. Fans for the three largest precipitators are mounted adjacent to the scrubber.

### Zinc Pigmented Paint

Wilbur & Williams Co., Dept. MF.  
Boston 35, Mass.

The above company has devised a

STRIFUGAL PUMPS • PRESSURE FILTERS • ION AND HEAT EXCHANGERS • RUBBER LININGS • WASTE-TREATING EQUIPMENT

*Industrial*

# INDUSTRIAL

## FILTER & PUMP MFG. CO.

5906 OGDEN AVENUE • CHICAGO 50, ILLINOIS

# LEA COMPOUND



**...the start of a leading world-wide business  
in Surface Finishing Service and Supplies**

In the early twenties some revolutionary thinking, tied in with the trade name LEA, sparked major changes in both methods of and materials for polishing and buffing. The basic idea was that surface finishing need not be messy . . . that such operations could and should be clean. Revolving initially around Lea Compound, the first greaseless abrasive composition made available to industry, and later around other LEA compositions of comparable quality, new abrasive finishing procedures resulted in either better finishes, lower cost finishing, or both.

Yes, Lea Compound surely did revolutionize both finishing methods and materials!

Today, Lea Compound is used all over the world and is available in many kinds and grades of abrasives. It is complemented by LEAROK, the bright finishing bar with "no-free-grease" . . . by LEA Liquabrade, industry's noted liquid abrasive . . . and a host of buffing and polishing specialties. LEA methods are now used by many of the largest plants with finishing production lines.

The salient point to remember when you deal with LEA — for both service and supplies — is that you are dealing with long established and thoroughly experienced Surface Finishing Specialists.

## LEA COMPOUND and its family of FINISHING SPECIALTIES

- LEAROK** . . . industry's "no-free-grease" buffing composition.
- LEA LIQUABRADE** . . . safe, uniform, stable spray liquid buffing composition ideal for production line work.
- LEABRAMENT** . . . quick drying, liquid spray abrasive for burring, polishing or satin finishing.
- AD-LEA-SIVE** . . . glue base adhesive for sizing flexible polishing wheels.
- LEA GRIPMASTER** . . . polishing wheel cement.
- LEA LIQUALUBE** . . . water soluble polishing wheel and belt lubricant.
- LEATARDENT** . . . stain and tarnish preventive for plated surfaces.
- LEA KROMSAVERS** . . . mist loss preventive for plating solutions.
- LEA LAPPING PASTE** . . . micron size controlled abrasive paste for fine surface finishing.

*plus*

Superior Plating Solution Addition Agents for copper, nickel, cadmium, gold, silver, brass, etc. . . . developed by Lea-Ronal, Inc.



Burring, Buffing, Polishing, Lapping, Plating and Spray Finishing. Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions. Manufacturers of Lea Compound and Learok. Industry's quality buffing and polishing compounds for over 30 years.



**THE LEA MANUFACTURING CO.**  
16 CHERRY AVE., WATERBURY 20, CONN.

Representatives: The Lea Manufacturing Co., 16 Cherry Ave., Waterbury 20, Conn.  
The Lea Company of Canada, Ltd., 200 Victoria St., Toronto 1, Ontario  
Lea-Michigan, Inc., 1000 E. 12th Ave., Detroit 26, Mich.  
Lea-Ronal, Inc., 1000 E. 12th Ave., Detroit 26, Mich.  
Manufacturing Plant: 217 East Avenue 16, Waterbury 20, Conn.



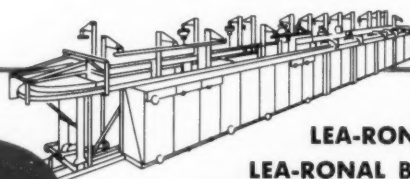
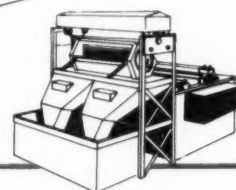
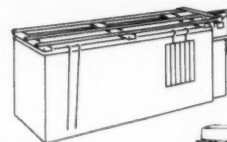
*Reviewing*

# Lea-Ronal

## PLATING SPECIALTIES



Each helps to provide  
**BETTER PLATING**  
**LOWER COST or BOTH**



Here are  
the Big

# 8

LEA-RONAL Bright Copper  
LEA-RONAL Bright Acid Copper  
LEA-RONAL Bright Nickel  
LEA-RONAL Bright Silver—Industrial  
LEA-RONAL Bright Silver—Decorative  
LEA-RONAL Bright Gold—Industrial  
LEA-RONAL Bright Gold—Decorative  
LEA-RONAL Bright Cadmium

### PLUS ADDITIVE AGENTS

**SUPERTARTRAL:** better and more economical than Rochelle Salt.

**CUPRALL:** maximum speed of copper deposition, improved buffability.

**WATERSHED:** free rinsing and fast drying; reduced or eliminated spotting.

**WETTING AGENT CW-6:** usable in all cyanide copper baths; stable, free rinsing.

**TST PURIFIERS:** greatly increased tolerance to chromium and zinc in cyanide baths.

**LEA NICKEL-GLO:** a 'no sludge' agent for barrel plating; minimized or eliminated burnishing of small parts.

**LEA MIRRO-GLO:** similar to Nickel-Glo but for still tank plating.

These are all superior products, proving in production that they do a stand out job of providing better plating, more economical plating or both. It will pay you to get all the facts. When writing, it would help if you would send data concerning your plating problems. Sample, if possible.

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announcement of  
several new  
developments.



Lea-Ronal, Inc., Jamaica, N. Y.  
Lea-Michigan, Inc., Detroit  
The Lea Mfg. Co., Waterbury, Conn.  
Lea Mfg. Co., of Canada, Toronto

Plating Polishing Buffing  
Burring

# Lea-Rona! Inc.

Sales and Manufacturing Office  
227 East Aurora Road, Waterbury 10, Conn.  
Main Office and Laboratory  
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95% pure zinc coating which is applicable with a brush or spray gun to standing structural parts, for the purpose of renewing galvanizing on parts that have lost the original protective coating or of applying a zinc protection to standing equipment which being already in position could not otherwise be zinc coated.

#### Permanent Floor Patch

*Colonial Refining & Chem. Co.,  
Dept. MF, 817 NBC Building, Cleveland 14, O.*

A floor patching material that can be applied over wet floors, with unusual resistance to oil, grease, acids, and alkalis, comes in powder form and is mixed with water at time of application. Special quick-setting powders have been added to the mixture, which assures maximum setting up time of 4 hours. Floors repaired with "45" Patch can be put back into use within 24 hours.

The material is not to be confused with temporary asphalt type, coarse grained patch materials on the market today. It forms a permanent bond with the existing floor area and it will last as long as the floor itself, according to the above manufacturer. Other advantages claimed is that it can be painted over and it can be used inside or out. It will not chip or crack once it sets.

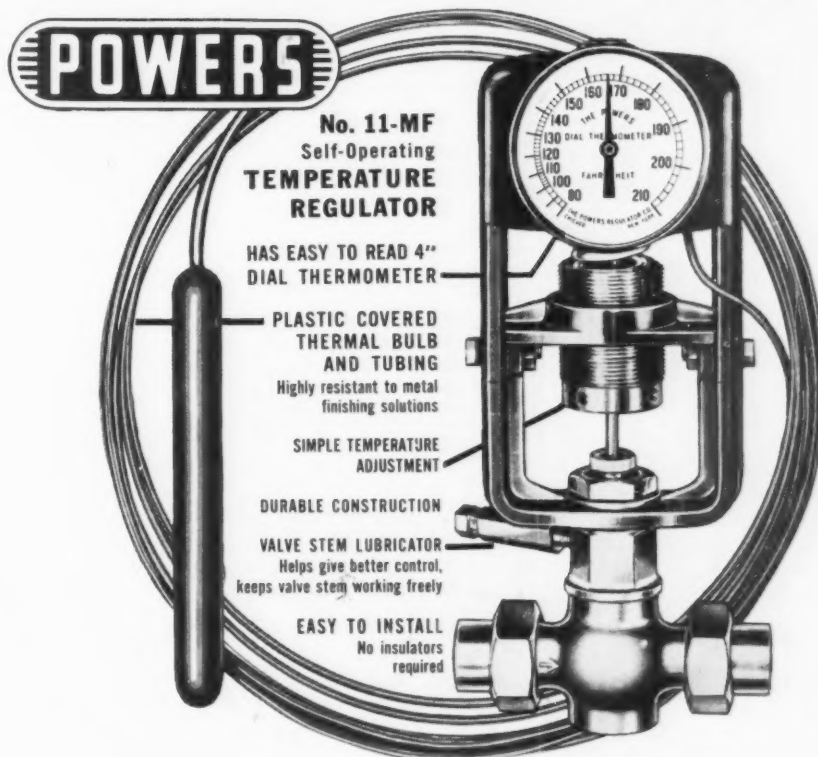
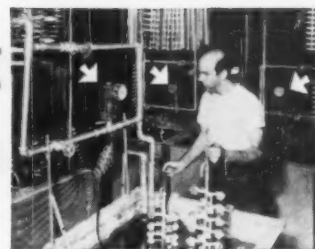
#### Portable Air-Motor Pump

*Vanton Pump & Equip. Corp., Dept. MF, 201 Sweetland Ave., Hillside, N. J.*

The above manufacturer announces the availability of a new portable air-motor driven, self-priming chemical and slurry pump. Where safety in handling hazardous liquids is a prime consideration, this unit offers complete explosion proof design, as well as a total elimination of stuffing box or mechanical seal leakage.

The use of an air motor offers a wide range of variable speed operation. By means of a simple valve control a variable rate of fluid flow can be obtained. The compactness and light weight of the pump motor set enables mounting on casters and makes it an ideal portable unit for handling most acids, alkalis, solvents, and a wide variety of similar products where corrosion, abrasion or contamination is a problem. Overall dimensions of the mounted pump with

## For Plating, Cleaning and Rinse Tanks



**Simplest, Most Reliable Control Made**  
**Holds Temperature at the Right Point**  
**Savings Often Repay Its Cost 3 to 6 Times a Year**

**Why Powers No. 11-MF Regulator Gives Better Control and Lasts Longer—** better TEMPERATURE Control results from powerful bellows and minimum of valve stem friction. Valve Stem Lubricator aids easy movement of valve stem without binding. Double ply metal used in Powers bellows outlasts ordinary single ply type. Greater durability of plastic covered bulb and tubing also helps prolong the life of the regulator.

**Dial Thermometer** indicates temperature of solution under control. It gives a visual check of the process and makes it easy to adjust regulator for different temperatures.

**Eliminate "the human element"** in temperature control with Powers automatic Regulators. They're simple, compact and dependable. They stop OVER-heating, prevent "boil-overs," waste of steam, water wasted by evaporation, burnt plated parts, rejects, decomposition of costly additives and loss of volatile ingredients from cleaning solutions.

Powers Nationwide Service and 24 Hour Delivery in the U.S.A. are important time and money saving advantages. Order a Powers No. 11-MF Regulator now. Call your supply firm or write us direct for Bulletin 330 and prices.

(c43)



### THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS | Offices in chief cities in U.S.A., Canada and Mexico

Over 60 years of Automatic Temperature and Humidity Control

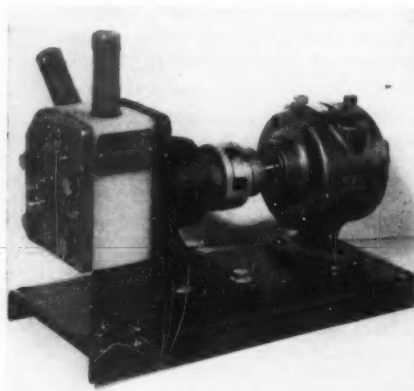


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**BETTER FINISHES & COATINGS, INC.**  
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air motor are 13" x 7 1/4" x 5 1/4" deep. The unit can be furnished with a reversible feature enabling the pump to be operated in either direction. In addition to lower initial and operating

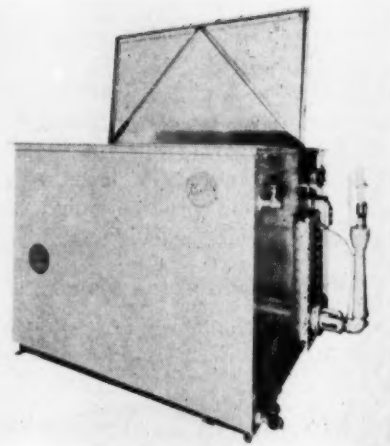
costs, this unit offers a minimum of maintenance since there is no harmful effect due to overloading and the only wearing part of the pump is the inexpensive flex-i-liner.

The pump design has eliminated the need for check valves, gaskets, stuffing boxes or mechanical seals of any sort. Pumps are furnished in plastic, rubber or stainless steel construction, depending on the application. Capacities to 20 g.p.m.; pressure to 50 p.s.i.

#### Automatic Degreaser for Hot or Cold Operation

*The Kleer-Flo Co., Dept. MF, 250-56 West 57th St., New York 19, N. Y.*

A new, mechanically agitated de-



greaser, designated as Model PW1000, has a capacity of 1,000 lbs., and is designed for production cleaning.

The work platform (60 inches x 45 inches) moves up and down through the cleaning compound at the rate of 38 complete strokes per minute. This powerful action forces the cleaning compound into all crevices and tapped holes, thoroughly flushing out dirt, grease and metal chips.

The machine can be used as a cold solvent cleaner or it is available heated by gas, electricity or steam for use with detergents and water. All heating apparatus is mounted in a completely removable clean-out door. Mechanical agitation is powered by a three H.P. motor, and the tank is constructed of 1/8" steel plate.

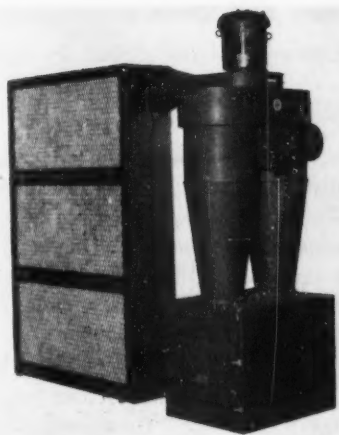
#### After-Filter for Dust Collector

*Torit Mfg. Co., Dept. MF, 287 Walnut St., St. Paul 2, Minn.*

Highly effective filtration through its six throw-away filters is one of several features of the new after-filtering mechanism designed for the above manufacturer's Model 219 FM-A cyclone-type dust collector.

Thick pads of glass insulation wool on each of two open surfaces on the after-filter frame remove any fine dust that has not already been trapped in the collector's internal reservoir. Company engineers claim that there is no loss in the machine's initial performance data after a filter change. Each filter is held to the frame by six wing nuts, and they may be quickly removed for replacing material. Frame is 20-gauge steel with blue-gray wrinkle finish.

The after-filter measures 81" x 51"



x 14", can be easily connected to any new or used 210 FM, and costs about \$350.

#### Acid Resisting Floor Sealer

Maintenance, Inc., Dept. MF, Wooster, O.

A new method of protecting concrete, bituminous, mastic or other industrial floors against acids, water, and cutting oil damage consists simply of applying a seal coat of liquid Jen-nite J-16 over the exposed floors, according to the manufacturer. This can be accomplished by either brush, spray or squeegee at the rate of one gallon per 100 sq. ft. While two coats are said to give adequate protection, three applications are recommended in extreme cases. The final coat should be allowed to cure eight hours before use. If an abrasive surface is desired, this can be obtained by incorporation of silica sand into the top coat.

The coating dries to an attractive velvety gray-black and is claimed to withstand the attacks of most chemicals used in industry. It is completely impervious to water and resistant to petroleum derivatives including gasoline. In addition, it is spark proof and easy to clean.

Because it is not affected by elements of weather, the chemical resistant floor coating can be extended outside onto loading docks, driveways, etc. Also, it is said to stop dusting nuisance of concrete and make all floors easier to clean.

The material is available in 5-gallon cans, 30 and 55-gallon drums.

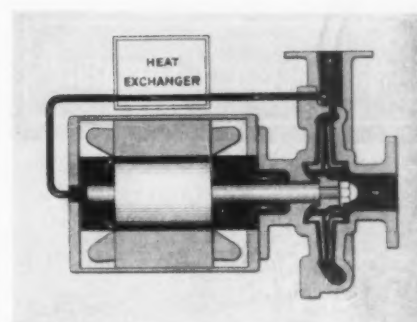
#### High Temperature Pump

Chempump Corp., Dept. MF, 1300 East Mermaid Lane, Philadelphia 18, Pa.

Combining an integral heat ex-

changer with a special high temperature pump design, this newest addition to the line of leak-proof "canned motor" Chempumps is claimed to be ideal for handling hot fats, hot oils and similar fluids at temperatures as high as 1,000 degrees F.

As with previous models, pumped fluid enters the motor chamber of the combined motor pump. However, the necked down area between motor and pump sections (see diagram) provides both a thermal barrier and a narrow restriction for passage of hot pumped fluid. A secondary impeller, mounted on the rotor, circulates rotor chamber fluid through a water cooled heat exchanger mounted in the circulation line. Intermixing of hot fluid in the



pump chamber and relatively cool fluid in the rotor chamber is very slight.

Model CHS pumps are available in 5 and 7½ horsepower sizes and Model CFT units in ¾ and 1½ horsepower. Maximum head developed is 195 feet and maximum capacity is 250 g.p.m.

The world's most economical gold plate...

## Sel-Rex Bright Gold Process



The new  
"GOLD  
STANDARD"

### SAVES YOU MONEY 5 WAYS

- 1 ... produces a mirror-bright finish directly from the bath regardless of thickness requirements—eliminates costly, wasteful scratch brushing and buffing.
- 2 ... assures a uniform thickness even on edges, in crevices and "blind holes"—has far greater "throwing power" than any other gold plating process.
- 3 ... gives 40% more resistance to wear and abrasion—has twice the hardness of conventional 24 karat gold plate.
- 4 ... gives six times greater protection with ¼ the amount of gold ... because it produces denser deposits than any other process — proved in salt spray tests under standard ASTM conditions.
- 5 ... costly rejects due to altered or deformed contours (common in conventional gold plating) reduced to the barest minimum — has a unique physical property which assures consistently smooth, uniform deposits.

The new SEL-REX BRIGHT GOLD solution operates at room temperature and is simple and easy to maintain. No special equipment required. Hundreds of successfully operating installations, both decorative and industrial, prove that SEL-REX BRIGHT GOLD has rendered all other 24 KT. gold plate obsolete.

Free technical literature on request

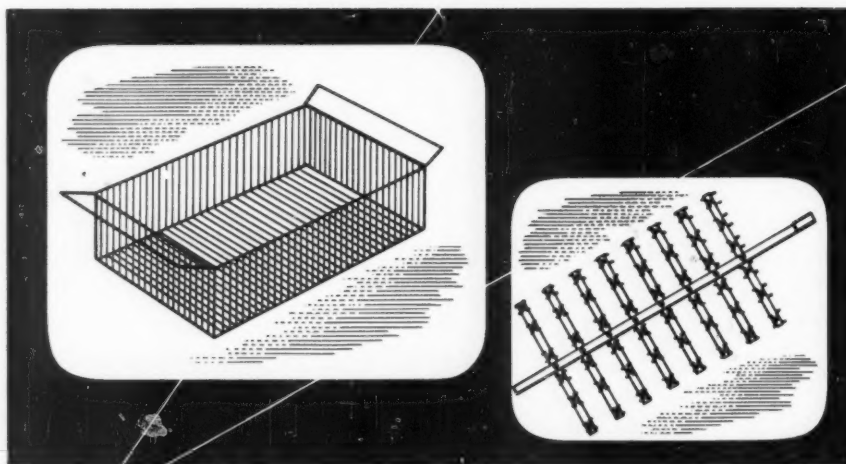
BRIGHT GOLD PLATING PROCESS  
HIGH SPEED SILVER PLATING PROCESS  
BRIGHT RHODIUM PLATING PROCESS



**SEL-REX PRECIOUS METALS, INC.**

229 MAIN STREET • BELLEVILLE 9, N. J.  
Newark Detroit Los Angeles



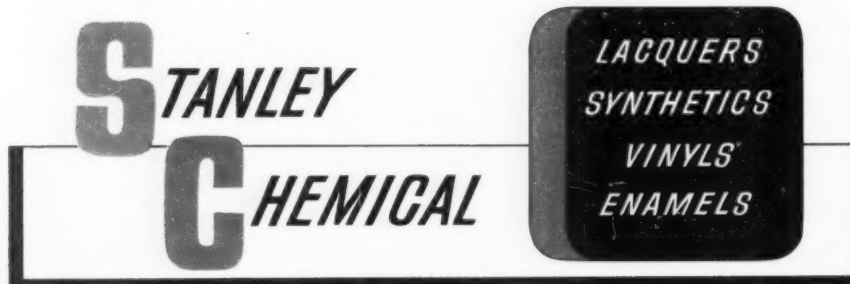


## PLATING EQUIPMENT STANDS UP LONGEST... with a COATING OF STANLEY CUSTOM PLASTISOL

Racks and other containers handle work with care if they're coated with one of Stanley's complete line of plastisols. High resistance to most chemicals plus a slick surface for fast drain-off and minimum carry-over add up to surface protection that lasts. If your operation uses trichlorethylene or perchlorethylene, specify Stanley 77X-1078 orange plastisol. Write for

details to Stanley Chemical, 81 Berlin St., East Berlin, Conn.  
Midwest representative: Russ-Howell Agency, Detroit and Grand Rapids.

Ask for FREE Bulletins on Stanley plating rack coatings.



### Manufacturers' Literature

#### Cleaning Equipment and Materials

Magnus Chemical Co., Inc., Dept. MF, Garwood, N. J.

A new booklet entitled "How To Select The Proper Method, Machine and Material," with 100 illustrations, is available. It shows various types of cleaning equipment, contains technical material which will help industrial plants in the selection of the method, material and machine best suited for their problems.

#### High Vacuum Pumps

F. J. Stokes Machine Co., Dept. MF, 5500 Tabor Road, Philadelphia 20, Pa.

"The Story of the Ring-Jet Pump," a new 8-page booklet, Bulletin 756, tells how and why the company developed its new line of diffusion and booster pumps to fill the need for faster pumping in the pressure range where most high vacuum processing is now being done.

The pumps are claimed to have pumping speeds from 10% to as much as 100% above the speeds of conventional diffusion and booster pumps of the same sizes and heat inputs. In particular, these pumps bridge the gap between 10 and 500 microns with remarkable efficiency.

#### Plate Coil Data and Prices

Thermo-Panel Div., Dean Products, Inc., Dept. MF, 616 Franklin Ave., Brooklyn 38, N. Y.

This 4-page bulletin, No. 256, gives both design and price information. Users and prospective users always welcome any literature that gives prices even though the prices are subject to change. It gives prices and tells how to make estimates.

The bulletin covers length and width variations; handles and hanger brackets; surface treatment; zinc metallizing; edge sealing weld; to make a closed cylinder; and half-couplings or pipe nipples. It contains eight illustrations and gives further design information for replacing pipe coils.

#### Clarifiers and Thickeners

Infilco, Inc., Dept. MF, Tucson, Ariz.

A bulletin entitled Infilco Clarifiers and Thickeners has just been published by the above manufacturers of water and waste treating equipment.

Questions on design requirements of clarifiers and thickeners for a wide range of capacities and solids removal loads are informatively answered in this sixteen-page, easy-to-read, graphically illustrated booklet.

The bulletin, W-300B — S-6000B, explains fully why circular sedimentation basins, sludge scrapers and central inlet wells are features of the clarifiers and thickeners.

#### Barrel Finishing Compounds

Newton Industries, Inc., Dept. MF, 100 Saw Mill Road, West Haven, Conn.

Four classes of precision barrel finishing compounds are described in a new set of four-page illustrated brochures. The compounds described are for a wide range of barrel finishing operations, from heavy deburring and cutting, to regular deburring, burnishing, and cleaning. In addition, rinsing and neutralizing compounds for between-stages operations are described.

Useful guide tables for correct finishing of metals, plastics, castings and parts are included for each compound and fully describe types of parts, amount of compound, type of media, amount of water, and finishing time.

### Corrosion Resistant Equipment

*Haveg Corporation, Dept. MF, 900 Greenbank Road, Wilmington 8, Del.*

A new 32-page catalog, C-12, fully illustrates and describes the above manufacturer's complete line of corrosion-resistant equipment.

The catalog features new materials of construction and evaluates equipment molded from polyvinyl chloride, epoxy glass and polyester glass, at the same time giving data on their resistance to chemicals and heat.

Also included is information about new cements for field servicing and new mortars for brick and tile. Rating data for exhaust fans, a description of a new method for fitting pipe on the job, and a revised chemical resistance table offer present users of molded plastic equipment a valuable supplement to their technical files.

### Germanium Rectifiers

*Bart-Messing Corp., Dept. MF, 229 Main St., Belleville, N. J.*

Standard models of Sel-Rex germanium rectifiers, from 500 to 50,000 amperes capacity, in either forced air or completely sealed water cooled design, are illustrated and described in a new folder.

### Water and Waste Chlorinator

*Fischer & Porter Co., Dept. MF, 539 Jacksonville Road, Hatboro, Pa.*

The Figure 1050A chlorinator for purifying water supplies, treating sewage and industrial wastes and for control of slime is illustrated and described in Catalog 70-10 just published.

A multi-colored flow diagram shows how chlorine gas and water are kept separate until they reach the ejector system. The catalog explains how this feature, together with the use of completely corrosion-resistant materials throughout the chlorinator, prevents corrosion of the equipment and makes it maintenance free.

Other corrosion resistant chlorination instruments illustrated are a high capacity chlorinator (8,000 pounds per day), portable chlorinator, chlorine solution distribution panel, chlorine solution flow indicator, hypochlorinator, flow indicating recorder, immersed float vacuum transmitter, reducing valve with pressure controller, and mercury manometer for differential pressure measurement.

# FORMAX

the Perfect Combination  
FROM START  
TO FINISH



**ZIPPO CLOTH BUFFS**

These famous long-wearing buffs run cool under all buffing conditions. High count bias-cut cloth is assembled on ventilated steel centers. Each section is perfectly balanced and faced—requires no raking.

**BUFFING COMPOUNDS**

Formax produces a complete line of buffing compounds in bar, tube and liquid form. Our extensive manufacturing, laboratory and testing facilities are at your disposal.

**ZIPPO SISAL BUFFS**

You have a pleasant surprise coming if you haven't tried the new Zippo bias-type sisal buff. It was specifically developed for steel buffing—to blend polishing grit lines—to cut down stainless steel—and bring up a bright lustre.

Other Formax products include the well-known C-20 Flexible Contact Wheels and F-26 Abrasive Belt Grease Stick.

*Descriptive Catalogs Sent on Request*

## FORMAX MFG. CORP.

DETROIT 7, MICHIGAN

### "THE FOUR McALEERS"

### Corrosion-Resistant Fabricated Alloy Products

*Rolock Incorporated, Dept. MF, Kings Highway East, Fairfield, Conn.*

An entirely new catalog, No. G-10, covers in one reference book both heat- and corrosion-resistant fabricated alloy products of the company. With more than 200 illustrations and accompanying descriptions, this is the most comprehensive manual of its kind yet to be published in these fields, it is stated. Included are sections on tanks and sinks, pickling equipment, processing equipment and plating room equipment.

Of special interest are many unique designs and patented constructions exemplifying advanced technique in

welded fabrication of Inconel and other specialized alloys. Illustrations also include a number of massive and complex fabrications in mufflers, furnace linings, retorts and tanks representing advances in design engineering and performance.

### Control Panel for Water Treatment

*The Permutit Co., Dept. MF, 330 West 42nd St., New York 36, N. Y.*

The steel cubicle method of installing instruments and electrical controls for a water conditioning plant offers several advantages. It permits factory assembly, wiring and testing before shipment. It centralizes instruments and controls and thus eases the



**Perma-Line**

**has helped to solve them ALL!**



Send for  
**FREE Book . . .**  
**"Perma-Line Linings**  
**for INDUSTRY"**



Perma-Line corrosion and erosion resistant products and services have, for many years, solved corrosion problems in various industries at a reasonable cost.

Our experienced technical staff is prepared to help you solve those corrosion "bottle-necks" that slow down production in your plant or field operations.

Why not consult Perma-Line about your particular corrosion problems? Inquiries given prompt attention.

**Perma-Line Corrosion-Resistant Services and Products include:**

Plant and Field Installations • Metal and Rubber Fabricated Parts • Tank and Tank Linings • Perma-Coil Heat Exchanger Coils • Ventilation and Exhaust Systems • Pipe and Fittings • Brick and Mortar • Perma-Plugs • Plating Accessories • Anode and Industrial Baskets • Coatings and Paints

**PERMA-LINE RUBBER PRODUCTS CORPORATION**

1753 No. Winnebago Ave. • Chicago 47, Illinois • Tel. HUmboldt 9-2020

burden on both operating and maintenance personnel. To illustrate the advantages of cubicle instrumentation, the company has prepared a colorful 8-page bulletin No. 4178.

Of interest to engineers dealing in water-conditioning problems or in utilization of ion exchange equipment, this bulletin shows typical assemblies of conventional and graphic type cubicles and a number of installations in various industries and for applications which include power stations, metal recovery, municipalities, demineralization, electroplating, etc.

#### **Axial Airfoil Fans**

Chicago Blower Corp., Dept. MF,  
9869 Pacific Ave., Franklin Park, Ill.

A free illustrated bulletin describes

the above manufacturer's newly redesigned, improved line of axial airfoil fans. Bulletin AA-101, which explains their function and design in detail, may be obtained by writing on letterhead to the above address.

#### **Submerged Combustion Equipment**

Thermal Research & Engineering Corp., Dept. MF, Conshohocken, Pa.

Bulletin No. 110 on Thermal submerged combustion equipment is now available for general distribution. The application of high velocity burners to submerged combustion offers industry one of the most effective methods for heating a liquid. The equipment is extremely compact and is unique in

that combustion takes place external to the liquid being heated. Rated outputs up to 5,000,000 b.t.u./hr. in a single tube may be obtained from standard burners.

#### **Solution Filters**

Bart-Messing Corp., Dept. MF, 229  
Main St., Belleville, N. J.

Six new catalog sheets on the complete line of Sel-Rex Double Duty filters for liquid clarification or solids recovery have just come off the presses.

Illustrated and described are standard portable, mobile and stationary units from 250 to 18,000 G.P.H. capacities, incorporating special design features which, it is reported, permit thorough cleaning in 15 minutes or less. Also illustrated are new filter elements—stainless steel mesh annular and leaf type elements and a disposable paper cartridge—depending on the specific model and application.

A complete set of this new literature may be had by simply writing to the above manufacturer.

#### **Polishing Machines**

Queen City Machine Tool Co., Dept. MF, 3900 Kellogg Ave., Cincinnati 26, O.

A 24-page illustrated catalog is now available on the above firm's ball bearing grinding, polishing and buffing machines. Descriptions are given of each grinder and buffer, including motor, wheels, equipment, dimensions, weight and code word.

#### **Burnishing Machines**

Tumb-L-Matic, Inc., Dept. MF, 4510  
Bullard Ave., New York 70, N. Y.

Burnishing machines for wet-ball burnishing of jewelry and other small metal parts are described and illustrated in a new 2-color bulletin BB55.

The bulletin covers two types of burnishing barrels. One is a conventional wooden barrel made of the above manufacturer's specially-treated hard maple. The other is a molded barrel made of an exclusive abrasion-resistant material called Tumb-L-Dur. Both can be fabricated into removable pocket and multi-compartment tumblers for many special applications.

Operating features for both types of barrels are given, plus specific applications of the machines to any given job. Three photographs illustrate the



units. A table of specifications lists model numbers, tumbler sizes and floor space required for installation of complete units.

### Solvent Recovery

*Carbide and Carbon Chemicals Co.,  
Dept. MF, 30 E. 42nd St., New York  
17, N. Y.*

A new 36-page booklet (Form 4410D) on the firm's activated carbon system of solvent recovery gives technical data on activated carbon and describes the efficiency and economy of recovering solvent vapors in a variety of industries.

Complete recovery plants with capacities from 50 gallons of solvent a day to over 100,000 gallons a day are designed and supplied for specific conditions and requirements.

### Aluminum Pipe and Fittings

*Aluminum Company of America,  
Dept. MF, 1501 Alcoa Bld., Pittsburgh  
19, Pa.*

Aluminum pipe for conveying everything from air to acid is thoroughly described in a new 18-page booklet.

Entitled "Aluminum Pipe and Fittings," the booklet presents the product's characteristics and advantages for each of its major fields of application. Specifications are provided, along with a description of appropriate fittings and methods of installation.

After a brief introduction, the new two-color book describes process industry applications of aluminum pipe and its advantages for that type of service. Similar treatment is accorded other fields of use, including pipelines, portable piping, and structural piping.

Fittings and valves for each of these categories are presented next. Installation details follow, including: Cutting, bending, beveling, grooving and threading; welding and joint make-up; use of supports; thermal insulation; and methods for protecting aluminum pipe from weathering, soils, dissimilar metals, concrete and plaster.

A series of tables and graphs, providing extensive dimensional and performance data, completes the book. Tables include standard dimensions and weights for aluminum pipe, standard dimensional tolerances, data on



### what's your finishing problem?

Let CASALBI's experimental engineering service analyze your parts finish needs. Send samples of parts and completed piece to show desired finish. CASALBI will provide detailed cost-saving finishing recommendations. Write today! No obligation, of course.

Write Dept. 44 for Tumbling Barrel Bulletin C-1

**Casalbi Company**  
WEST GANSON & WAYNE • JACKSON MICHIGAN  
GLOBE tumbling barrels have been serving industry since 1902

spacing of supports, and loss of head for flow of water in pipe.

### Dust and Vapor Collectors

*Aget Mfg. Co., Dept. MF, Adrian,  
Mich.*

Two new and revised catalogs cover the entire line of Dustkop, industrial dust collecting equipment, and Mistkop, industrial vapor collecting equipment. Bulletin No. 636-3 offers valuable and practical engineering information on industrial dust control, its installation, operation and maintenance. It also features a wide range of models for most every application requirement.

Bulletin No. 622-3 offers the same

technical and practical information on the above manufacturer's line of industrial vapor collectors.

### Process Equipment

*Hagan Corporation, Dept. MF, 323  
Fourth Ave., Pittsburgh 30, Pa.*

Automatic control and instrumentation components, water conditioning and steam testing equipment, chemical feeding devices, chemicals for metal protection—these are some of the subjects discussed in a new 28-page bulletin, GSP-901, which summarizes the products and services of the firm and its three subsidiaries, Calgon, Inc., Hall laboratories, Inc., and the Buromin Company.

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**ELECTROPLATING GOLD**

In our work with Electroplaters we generally find that they are reconciled to wastage — until they learn they may be losing \$60,000 or more of every \$100,000 paid for gold. Exorbitant waste is often due to outmoded equipment and inefficient electroplating methods and solutions. We correct these conditions so effectively that your cost can drop to a record low figure — while you increase efficiency and achieve predetermined standards of deposition that can be repeated indefinitely.

With Technic aqueous gold solutions and Technic-engineered installations we bring existing operations under scientific control, and we initiate new operations custom-engineered to do the job right.

Our Engineering Service is available, without obligation . . . and every proposal we make is backed by solid experience with problems like yours.



**TECHNIC, INC.**

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*The World's Best Soluble Gold and Rhodium*

## NEW BOOKS

### Handbook of Engineering Materials

*Edited by D. F. Miner & J. B. Seastone. Published by John Wiley Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 1955. 1382 pages. Price: \$17.50.*

This handbook differs from other such works in that it is not limited to any specialized phase of engineering but comprises a single source of information on constructional and manufacturing materials employed in all branches of engineering. Also rather

unusual are the numerous literature references and suggested sources for further information, such as trade associations and manufacturers.

The emphasis is on numerical data so that descriptive material is kept to a bare minimum. In this connection, the book may be said to cover mainly properties, adaptability, availability, costs, and limitations of materials. Methods of manufacture are considered of secondary importance.

For the commonly employed materials of construction, this handbook will replace the numerous volumes found on the engineer's reference shelf. Its aim of giving the user maximum assistance in the selection and use of materials is well fulfilled from the practical standpoint.

## Plastics for Corrosion-Resistant Applications

*By R. B. Seymour & R. H. Steiner. Published by Reinhold Pub. Corp., 430 Park Ave., New York 22, N. Y. 1955. 411 pages plus subject and author indexes. Price: \$7.50.*

After describing the chemical and physical properties of plastic materials, the authors discuss their uses as protective coatings, mortar cements, casting resins, foams, impregnants, industrial adhesives and reinforced materials. Of much more importance to the plater and engineer are the sections on plastic piping and ductwork, valves and fittings, corrosion resistant floors, sumps and tanks. A vast amount of comparative data will be found in this volume, which will serve as a ready guide in choosing the most suitable plastic materials for corrosion-resistant applications.

Many illustrations have been employed showing actual use of plastics as construction materials and the indexes would be considered quite complete.

## BUSINESS ITEMS

### Michigan Chrome Opens New Division

The opening of a new *Coating Division* of *Michigan Chrome and Chemical Co.* was recently announced. The new coating plant is located at 275 Iron St., Detroit 7, Mich., and is 12,000 square feet in area. A large new



Frank Jones

convection oven can handle the largest industrial equipment and smaller ovens are available for additional production. Smaller parts, such as baskets, automotive accessories, etc. are conveyORIZED and processed in a tunnel-type oven.

Various types of coatings are applied, but primarily plastisols which are especially adapted to meet industrial needs. Chemical corrosion resistance, abrasive resistance, resilience, and toughness are characteristic qualities of these plastisol coatings.

The Coating Division has the largest dip tank in the country, for this type of application, it is claimed. The plant is also equipped for spraying which is a new development in the application of Microsol coatings.

Frank Jones has been appointed manager of the division. Jones, formerly assistant sales manager of the Chemical Division, will supervise all activities of the new division.

#### Elrick Joins Tect, Inc.

Appointment of Robert M. Elrick as New England district manager for Tect, Inc. of Dumont, N. J. was announced recently.

Mr. Elrick served in the United States Army, Chemical Warfare Service, as Chief-of-Section in the Pacific Ocean area and has, for the past 10 years, been senior chemist of the Connecticut State Department of Health, Bureau of Industrial Hygiene.

He is a director of the Hartford, Conn. Junior Chamber of Commerce and has been active in other civic organizations.

He will represent the firm in offering its line of safety solvents to indus-

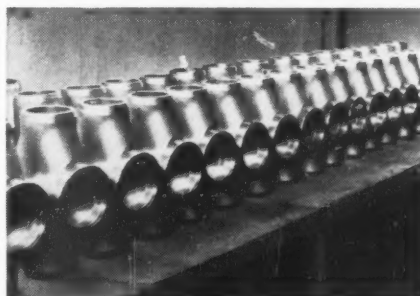


Robert M. Elrick

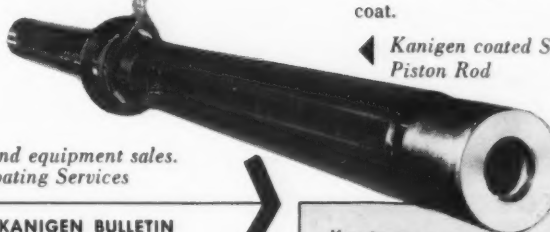
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New properties! New applications! Kanigen® process deposits, by chemical means, from a chemical bath, a uniform, hard, corrosion-resistant nickel-phosphorus coating on iron, copper or aluminum and their alloys . . . without the use of electricity. Here are only a few of many applications . . . for detailed data send for "Kanigen Bulletin".



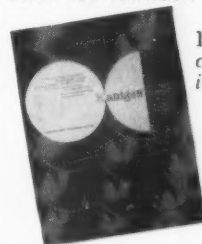
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CHROMIUM  
CORPORATION  
BUFFALO 13, N. Y.

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Hardness can be varied from 50 to 70 Rockwell C. Here's surface hardness for aluminum and brass—permits soldering—uniform even on complex shapes . . . accuracy of coatings up to .007" eliminates post-grinding operations.

Virtually zero porosity makes Kanigen superior to electro-deposited nickel of equal thickness. Protects material in process from iron pick-up. Serves as intermediate or bonding coat.

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trial plants and will also endeavor to assist manufacturers in finding solutions to their toxicity problems.

#### Changes at Graham, Crowley & Associates

Graham, Crowley and Associates, Inc., consulting electrochemists and engineers, report a number of changes.

The company's general offices and Chicago research laboratory moved into improved quarters at 5465 W. Division St., Chicago 51, Ill., on October 31. A new branch office was opened on October 1 at the site of the company's pilot plant, 2152 Portage St., Kalamazoo, Mich., in order to better serve industry in the Michigan area with respect to electropla-

ting, industrial waste treatment, and engineering matters. Frank K. Savage, vice-president, has been appointed manager.

John L. Stephens has joined the company's laboratory staff at Jenkintown, Pa. Mr. Stephens was formerly employed by the Cannon Electric Co., Los Angeles, Cal., in their electroplating department. He received his B.S. degree in chemistry from the University of Kentucky in 1951.

#### Albrecht Joins Diamond Alkali

Kurt Albrecht, of Pittsburgh, Pa., has joined the detergent section of Diamond Alkali Co.'s Silicate, Detergent, Calcium Division as a research chemist.

Albrecht comes to the company



from Calgon, Inc., a division of Hagan Corp., Pittsburgh, where he has been a chemist and group leader in detergent research for the past 18 years.

A native of Illinois, born in Chicago, Albrecht earned his A.B. degree in chemistry in 1937 at Wittenberg College, Springfield, O. He is a member of the American Chemical Society and The American Society for Testing Materials.

In his new post, Albrecht will be concerned principally with development of new detergent formulations, direction of technical service work on metal-cleaning applications of Diamond chemicals, and improvement of analytical techniques.

Albrecht, his wife and children plan to live in or near Painesville.

#### Expansion at Graver

The *Graver Water Conditioning Co.* has announced an expansion of its offices at 216 W. 14th St., New York. A large portion of office space in its present location has been added to that already occupied. Along with the acquisition of new space the firm has just completed a complete redecoration of all its offices.

#### Engelberg Announces New Dealers

*Engelberg Huller Co.*, Syracuse, N. Y., announces two new dealer appointments for their expanded line of abrasive belt machines. *Do-All Eastern Co., Inc.*, Long Island City, and the *Morey Machinery Co.*, New York City, will serve the Greater New York area.

#### Esbec Appoints Denn-Burr

The *Esbec Barrel Finishing Corp.* of Byram, Conn., has announced the appointment of *E. W. Denny, Denn-Burr Process Co.*, 8833 Philbin St., Arlington, Cal., as its representative in Southern California.

Mr. Denny, formerly a development engineer for General Electric Co., has put in local stocks of barrel finishing compounds so as to give Southern California industry the fastest possible service on the popular products.

#### Lasalco Announces New Officers

*Arthur G. Bignall* has been elected president of *Lasalco, Inc.*, St. Louis, replacing *Herman Struckhoff* who has



Arthur G. Bignall

resigned in order to establish his own metal finishing supply company on the west coast.

Mr. Bignall, formerly vice-president, joined the company in 1940 immediately after graduating from Purdue University where he obtained his B.S.M.E. degree.

Mr. Struckhoff will represent the firm in the western states on its complete line of electroplating equipment,

★ **BUFFING NU SPRA GLU**  
Liquid buffing compound  
since 1945

★ **NUGLU**  
Cold flexible glue  
since 1937

★ **BRUSHING NUGLU**  
Grain and Nuglu mixture  
since 1941

★ **SPRAY BUFFING EQUIPMENT**  
Guns, pumps, and valves  
since 1945

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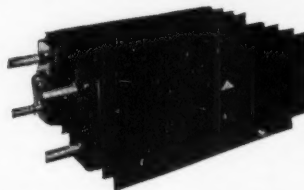
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RECTIFIER

For the Finest in  
**PLATING  
RECTIFIERS**

A BETTER SOURCE OF DC POWER —  
MORE FOR YOUR MONEY

★ Operate from —40° to 225° F.  
★ 50 to 50,000 Amperes DC  
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Two styles available—1. Selenium for cool zones, or 2. Magnesium copper sulphide for the hot, dirty jobs. Units still running after 4 years of constant duty.



Replacement Rectifier Stacks  
for Lektron or Udy-lite-Mallory

Magnesium copper sulphide rectifiers make your plating power supply more rugged and dependable. Magnesium radiator fins for fast heat dissipation and lighter weight. Matching pairs.

SOME JOBBERS AND SALES TERRITORIES OPEN



Model 4045—750 amps at 12 volts DC—1500 amps. at 6 volts DC. Operates on 208, 220 or 440 A.C. Weight 525 lbs. F.O.B. Indianapolis, Indiana.

**ELECTRONIC RECTIFIERS, INC.**

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INDIANAPOLIS 3, INDIANA



Norman K. House

as well as several other lines of finishing room equipment and supplies.

Norman K. House, formerly chief engineer of Lasalco, has been elected vice-president. B. G. Daw, formerly president of the company preceding Mr. Struckhoff, has been appointed a member of the board of directors. All other executive offices of Lasalco remain unchanged.

### Sloan Will Direct Pennsalt's Commercial Development Program

Russell W. Sloan has been advanced to fill the newly created position of manager of commercial development of the *Pennsylvania Salt Mfg. Co.* In this position he will be responsible for market analysis, market research and market development on new products and on established products new to the company.

Prior to his appointment Mr. Sloan served in a similar capacity on the staff of the Sharples Chemicals Division, a major component of the Pennsalt organization. He joined Sharples in 1947 after serving three years as an officer in the U. S. Navy and earning an undergraduate degree at Brown and completing graduate studies at MIT and Harvard Business School.

### Three Promoted by M-H Industrial Division

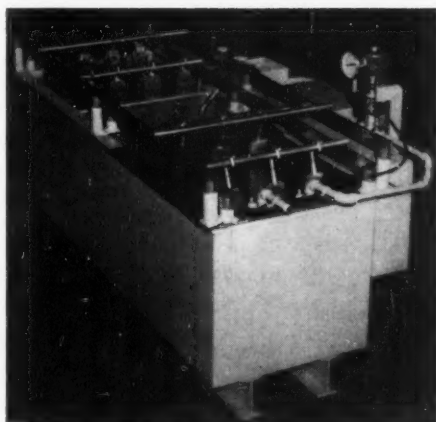
Promotion of three field sales engineers to key Industrial Division posts is announced by *Minneapolis-Honeywell Regulator Co.*

James W. Hughes has been named regional industrial sales manager for the company's Midwest region with headquarters in Chicago. Raymond A. Zack will become industrial sales manager in the company's Hammond, Ind. branch office, and Paul R. Sharadin has been assigned to the new position of regional application engineer for the Southwestern region with headquarters in Dallas, Tex.

Hughes, a graduate of Georgia Tech., joined the firm as an industrial sales engineer in Charlotte, N. C. in 1946 and was manager of the company's branch office in Birmingham, Ala. before his transfer to Chicago as branch industrial sales manager in 1954.

Zack joined the Baltimore branch industrial sales staff in 1949 following his graduation from Lehigh University. He was transferred to Chicago as an industrial sales engineer in 1954 and was transferred to the firm's new Hammond office when it was opened January 1, 1955.

Sharadin joined the company as an industrial controls service engineer in Dallas in 1951 and entered industrial



Tank design by  
United Chromium, Inc.

## Save with Stortswelded Tanks

STORTS experience in fabricating plating tanks and tank cycles for more than thirty years will help you to design for top performance and long range economy. Performance records prove that it pays to invest in STORTS single-standard welding — one quality for all customers.

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J. Holland & Sons offers you the most comprehensive operation in the entire finishing industry. Because we maintain one of the world's largest in-stock supplies of polishing, plating and spray equipment; we can deliver in-stock merchandise immediately upon your request.

You can forget about the problems of buying your requirements from numerous sources. Get dependability, complete satisfaction and "one-stop" buying from under our large roof!

Our engineering and technical staff is ready to assist you in solving special problems. We'll be glad to help!

## J. HOLLAND & SONS, INC.

leaders in finishing equipment for over half a century  
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sales work in the company's El Paso office the following year. He has been in charge of industrial sales in Odessa, Tex. since 1954. He is a graduate of Union College.

### Stauffer Chemical Co. to Erect New Research Center

Ground has been broken for the new addition to *Stauffer Chemical Co.*'s research center at Chauncey,

N. Y. Adding over 8,000 sq. ft. of chemical laboratory and office floor space, the addition will cost more than a quarter million dollars and should be completed by July first next year.

Chauncey is in the heart of Westchester County, surrounded by lovely residential districts and yet close to industrial New York and Northern New Jersey. The entire facilities are completely air conditioned. The most

modern research equipment and facilities have been provided.

Three other research centers are located at Richmond, Torrance, and Mountain View, California.

This is part of the firm's program of expansion for its research and development facilities.

### Connecticut Flood Victims Aided by Zell Products Corp.

Immediately following the October 15th floods in Connecticut, residents and manufacturers in the Norwalk area were confronted with the problem of drying out their motors and other electrical equipment, and testing the insulation before operations could be resumed. Motor baking facilities of local repair shops were entirely inadequate to handle the tremendous number of machines damaged by the inundation.

Being apprised of this situation, *Zell Products Corp.*, prominent manufacturer of ladies' compacts, banks, and leather goods, immediately placed at the disposal of the Chamber of Commerce the drying and lacquer baking facilities at their Norwalk

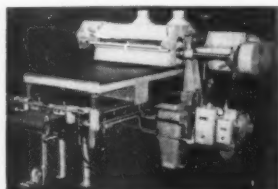


**VERSATILE!**  
*It Floats On Air!*

The buffs literally ride on air . . . . insuring uniform buffing pressures at any predetermined degree over flat or curved surfaces!

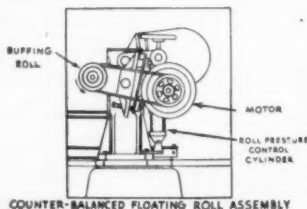
**CLAIR SURFACE FINISHING MACHINES**

Development of these Clair surface finishing machines is the answer to "demand-performances" from manufacturer's surface finishing departments for precision finishing machines of thorough capability and astonishing versatility.



**MODEL 203** This design has anticipated the need for holding the work, with vacuum, regardless of use for surface buffing over the entire area without salvage.

- Horizontal Design offers . . .
- ★ Waist high loading - - less operator fatigue!
  - ★ Better Visibility!
  - ★ Rolls can be changed in two minutes!
  - ★ Easier to exhaust and keep clean!



**CLAIR**  
**MANUFACTURING CO., Inc., OLEAN, N. Y.**

Offering the Most VERSATILE Line of Surface Finishing Machines

**THE KOCOUR METAL IDENTIFICATION SET MODEL PIA**

Rapid tests for the positive identification of cadmium, tin, silver, lead, nickel, chromium, zinc, absence or presence of chromate conversion films.

**EASY TO USE!**  
*Write for literature!*

● KOCOUR testing sets are used all over the world for controlling plating — cleaning — pickling — anodizing — and hardening processes . . . special sets can be provided for your requirements.  
Write today for complete information — no cost or obligation.

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4801 S. ST. LOUIS AVENUE  
CHICAGO 32, ILLINOIS  
Specify KOCOUR test sets from your supplier.



plant. The Chamber broadcast this offer over the radio and in local newspapers, and set up a system of priorities in order of importance.

Equipment was delivered to the Zell plant, where it was baked at 275 deg. F. for 8 hours, then tested at 500 volts by company engineers for insulation breakdown. The owners, who had been told to place identification tags on their machines with the phone number, were notified upon completion of the baking and testing. All this was contributed by the Zell company as a public service, at no charge.

#### A. B. Plating in New Location

The *A. B. Plating Supply Co.* has recently moved to its new location at 5625 S. Howell Ave., Milwaukee 7, Wis. The telephone number is SHeridan 4-3230.

#### Bacon Felt Opens New Plant Addition

A new 10,000 square foot addition to the manufacturing facilities of *Bacon Felt Co.* has just been opened at the firm's Taunton, Mass., plant.

The new section, a one story brick and masonry construction building, houses additional felt making and carding equipment that will make possible a 20% increase in the production of the felt wheels, bobs, and sheet felt manufactured by Bacon.

The new addition is the second major expansion undertaken by the

company in the last four years. In 1951 the firm moved from its Winchester, Mass., plant, comprising 25,000 square feet of production and office area, and moved to the 50,000 square foot facility it now occupies in Taunton. With the new addition, the firm's production area now exceeds 60,000 square feet.



Aerial view of Bacon Felt Company manufacturing facilities, Taunton, Massachusetts, showing new 10,000 square foot addition (arrow).

## BEAM-KNODEL CO.

Metropolitan Distributors

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Complete Service for Metal Finishing

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Stock With Reasonable Exceptions

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Tallow  
Rouge  
Emery Paste  
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**Pickling Pete  
Knows his stuff  
Picks Monel  
Because it's tough!**

Shop abuse doesn't faze Monel. It's tough and strong... good for years of pickling service in all common pickling acid solutions. For long-lived, lightweight equipment, look to Monel. Write for "5-Way Savings in Pickling."

THE INTERNATIONAL NICKEL COMPANY, INC.  
67 Wall Street, New York 5, N. Y.



extra life  
extra capacity  
extra safety



**Monel** Pickling Equipment

## George Prziborowski Joins Wyandotte Chemicals Sales Staff

George C. Prziborowski recently joined the industrial sales staff of Wyandotte Chemicals Corp. He will headquarter in the company's San Francisco district office.

Mr. Prziborowski is a chemical graduate of San Francisco State Col-



George C. Prziborowski

lege. He has served both the U. S. Navy and the Air Force and was recently Nuclear Research Officer, Special Weapons Command. He has been quality control chemist for a nationally known chemical products manufacturer and finishing department foreman for a steel products fabricator.

## Greenwood Named New Field Sales Manager for Stokes

Samuel H. Greenwood has been promoted to the position of field sales manager for F. J. Stokes Machine Co., Philadelphia, Pa., and Fred Hillsley has been appointed to succeed him as district manager of the Philadelphia territory.

In his new position, Mr. Greenwood will direct all of the firm's local sales activities in the United States and Canada, and will supervise the operations of the ten district offices, located in principal industrial centers from coast to coast.

Mr. Greenwood, a native of Cleveland, Ohio, received his B.S. in Mechanical Engineering from Case In-

stitute of Technology in 1941. Following active duty with the U. S. Navy, he worked as a development engineer for the American Meter Co., Erie, Pa., before joining the Stokes organization in 1949. Serving first as manager of plastics extruder sales, he was named Philadelphia district manager late in 1953.

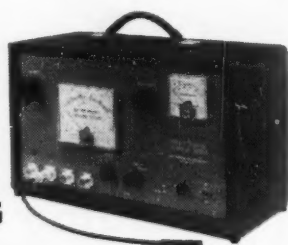
Fred Hillsley, born in Westchester



Samuel H. Greenwood

## The New "DERMITRON" NON-DESTRUCTIVE THICKNESS TESTER

FAST  
ACCURATE  
PORTABLE  
COMPACT  
DIRECT READING



FOR METALS ON METALS  
NON-CONDUCTORS ON METALS  
METALS ON NON-CONDUCTORS

You can have 100% inspection of production of nearly any possible coating on almost any base. The first and only non-destructive tester which gives fast, accurate, direct readings of such combinations as silver on brass, copper on zinc, metallizing on plastics, paint on metals—without the use of chemicals.

Patents  
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Manufacturers of Periodic Reverse Units and  
Electronic Equipment for the Plating Industry  
75 EAST FOURTH STREET • NEW YORK 3, N. Y.

Engineered for  
Extra Years of  
Trouble-Free  
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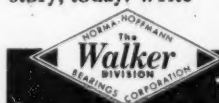
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Selenium Rectifiers

You can't beat Walker Selenium Rectifiers for dependable D.C. regardless of the size of your plating installation.

These outstanding rectifiers are especially designed to give year in, year out service . . . minimum maintenance . . . no moving parts . . . nothing to wear out . . . nothing to get out of adjustment.

You get more for your money when you use Walker Selenium Rectifiers. Get the complete story, today. Write



**THE WALKER DIVISION**

NORMA-HOFFMANN BEARINGS CORPORATION  
STAMFORD, CONNECTICUT

County, N. Y., stood first in his class at Cornell University when he was graduated in 1941 with a B.S. in administrative and mechanical engineering. After a brief period of service as an industrial engineer with Continental Mills, Philadelphia, he was called to active duty with the U. S. Army Ordnance Corps, from which he was discharged in December 1945 with the rank of major. He then returned to Continental Mills as plant engineer



Fred Hillsley

in charge of its power and maintenance department, remaining with this firm until recalled to military service in April 1951.

He then spent fifteen months at Frankford Arsenal, first as industrial engineer and later as officer-in-charge of its artillery ammunition department, and subsequently spent eight months in Korea. Returning to civilian life in March 1953, he joined Corning Glass Works as chief engineer of the company's plant at Central Falls, Rhode Island. He joined the Stokes organization in September 1953 as a sales engineer in the Philadelphia district office.

#### Wilgus New General Sales Manager for Electric Products Co.

The Electric Products Co., Cleveland 12, Ohio, announces the appointment of *Harvey Bertrum Wilgus* as general sales manager. In his new position, he will be responsible for the sales activities in all divisions of the company.

Mr. Wilgus brings to his new position a wealth of selling experience. He was formerly general sales manager

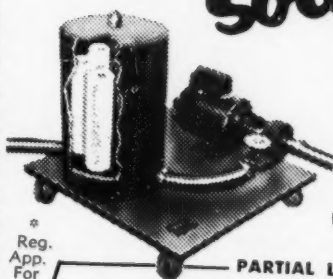
of Redmond Co., Inc., Owosso, Mich. Before joining Redmond in 1948, he had been with Barth Stamping & Machine Works, Inc., Cleveland, Ohio; Hercules Powder Co., Wilmington, Del.; and the Pa. R. R., Philadelphia. With these companies, Mr. Wilgus served as machine designer, sales engineer, district sales manager and division sales manager.

Membership affiliations include: So-



Harvey B. Wilgus

## Filter your solutions!



### 50-2400 GAL/HR

Model ASI-600 . . . Cap. 600-900 g/hr. Sethrin® Resin Filter Assembly. Stainless Centrifugal Pump. Totally Enclosed Motor . . . portable . . . Wt. 150 lbs. 2'x2'x2'

Distributors in principal cities. Write for literature.

#### PARTIAL LIST OF MODELS

Model	Rated Capacity	Overall Size	Weight
LSI-S	50 gal/hr	11"x14"x12"	30 lbs.
LSI-10	100 gal/hr	12"x16"x16"	40 lbs.
ASI-300	300 gal/hr	2'x2'x2'	125 lbs.
ASI-600	600 gal/hr	2'x2'x2'	150 lbs.
RLS-1200	1800 gal/hr	2'x3'x3'	300 lbs.

**SERVICE** . . . Filters practically any acid or alkaline solution from pH 0 to pH 14; removes particles down to one micron in size. Strainer stops metallic objects.

**DESIGN** . . . Filter Assembly fabricated of stainless steel 316, high temperature lucite, rubber-lined, Havg or Sethrin® resin. Filter Tubes of cotton, dynel, porous stone or porous carbon. Pumps fabricated of Hastelloy, stainless 316 or plastic; centrifugal or self-priming. Motors drip-proof, totally enclosed, or explosion proof, 110 or 220 volt, single or three-phase, 50 or 60 cycle, sleeve or ball bearing. Hose—special acid and alkali resistant. Base—Linen Phenolic laminate on rubber tire ball bearing casters.

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## Large Oblique Plater

for quantity production of small, hard-to-hold articles

No perforations—plates, needles, springs and small wire parts that catch in or slip through perforations in horizontal plating barrels.

Large barrel, 23" dia. by 23" deep; capacity, about 2 pecks. Made of heavy sheet steel lined with 1/4" thick vulcanized rubber.

Tilting lever and foot-operated lock simplify loading, unloading and removal of solution.

Chrome plated button contacts bring current through bottom. Only contacts in the work carry current.

Anode basket to use scrap anodes. Saves time—avoids waste.

Send for literature or ask BELKE Service Engineer.



Heavy spring-operated contactors conduct current only to contacts in work.

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MFG. CO., 947 N. Cicero Ave., Chicago 51, Ill.

EVERYTHING FOR PLATING PLANTS



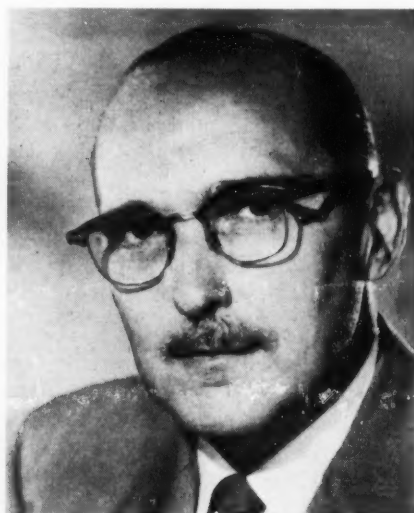
ciety of Automotive Engineers, American Ordnance Association and National Sales Executives Club. He attended Temple University, Philadelphia, Pa. and Kent State University, Kent, Ohio.

#### John H. Harris, Wallace T. Gray Appointed by Brush Electronics

Appointments have been announced



John H. Harris



Wallace T. Gray

of *John H. Harris* as vice-president in charge of planning and *Wallace T. Gray* as general works manager of the Brush Electronics Co., Cleveland.

Harris has been vice-president and general works manager for the firm, a division of *Clevite Corp.*, since 1948. In that post, he directed manufacturing, production control, maintenance and inspection.

Gray was formerly works manager for the Leece-Neville Company, also of Cleveland. Prior to joining Leece-Neville, he served as manager of the RCA Victor Division plant and as factory manager for Thomas A. Edison, Inc., Instrument Division.

#### Phelps Dodge Moves New York Office


The *Phelps Dodge Refining Corp.*, manufacturer of Triangle brand copper sulphate and nickel sulphate, announces the removal of its New York offices to 300 Park Ave., New York 22, N. Y. The telephone number is PLaza 1-3200.

#### Bogart-Bullock Co. to Represent Penn Instrument

The *Bogart-Bullock Co.*, engineering representatives for mechanical process equipment, has been appointed exclusive industrial sales representative in Southern California for *Penn Instrument Co.* of Philadelphia, Pa.

All equipment manufactured by Penn including flow meters (orifice and area type), pneumatic transmit-

*No New Penny  
Could be Brighter  
— than*



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**FOR ALL  
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**PRODUCES**  
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noxious  
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**PROVIDES**  
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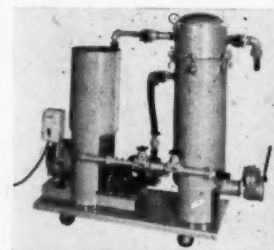
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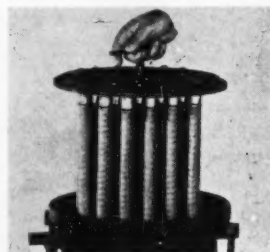
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- Fast
- Clean
- Economical

Eliminate costly maintenance of cleaning filters by backwashing. This new one minute cleaning operation will save you \$\$\$, time and trouble.



## PERMANENT FILTERS FEATURED



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Handles volumes from 350 to 15,000 gph. Stainless steel filters do not swell or change shape, and will handle both acid or alkaline.

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(In Canada, write Armalite Co. Ltd.)

ters, temperature and pressure recorders and controllers will be sold by Bogart-Bullock.

### Omaha Retinning Acquires Additional Facilities

The *Omaha Retinning Corp.*, Omaha, Neb. has purchased from the *Linzy Hicks Retinning Co.*, Omaha, Neb. their milk and cream can division which will include the retinning and rebuilding of cheese and ice cream cans, egg buckets and strainers, cottage cheese cans, cheese horns, cheese moulds, etc. Taking over this additional business means many additional customers for Omaha Retinning which is one of the leading retinning firms in the dairy, meat packing, and other industries.

### Ford Ballantyne, Jr., Elected to Wyandotte Chemicals Board

*Ford Ballantyne, Jr.*, vice-president and general manager of the *J. B. Ford Division of Wyandotte Chemicals*, was recently elected to the board of directors. He joined the production staff in 1942, was elected a vice-president in 1950 and became general manager of the division in 1953.

Mr. Ballantyne took an active part in planning and building the division's new Los Nietos plant, 16 miles southeast of Los Angeles. He received his education from Williams College and Lehigh University. Before joining the company he was employed by one of the country's leading banking institutions.

*Bert Cremers*, vice-president and general manager of the *Michigan Al-*

*kali Division*, was also elected to the company's board of directors. Mr. Cremers is one of the best known sales executives in the alkali industry.

### Donroe Joins Pyrene Metal Finishers, Inc.

*Pyrene Metal Finishers, Inc.*, announces the appointment of *Louis J. Donroe* as manager. He came with the firm in 1929 and left in 1947 to join



Ford Ballantyne, Jr.



Louis J. Donroe

**The DALIC PROCESS OF ELECTRODEPOSITION**

Used extensively throughout the Aircraft, Electronic, Electrical and Allied Industries for localized and "on site" plating.

Deposit	Maximum Current Density, Amp./ft. 2	Time to Deposit 0.0001 in. (secs.)
Cadmium	6.000	2.5
Chromium	4.000	63.0
Copper	6.000	2.5
Germanium	4.000	—
Gold	2.000	6.2
Indium	4.000	2.5
Iron	3.000	10.2
Lead	5.000	3.8
Nickel	5.000	5.1
Nickel (Black)	5.000	—
Platinum	3.000	17.5
Rhodium	3.000	70.0
Silver	1.250	5.1
Tin	5.000	2.5
Zinc	3.000	3.8

On an area equal to the pad electrode used.

**DALIC METACHEMICAL LIMITED**  
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**Zinc-Brite**  
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**ZINC SOLUTION PURIFIER**

Eliminates heavy metal impurities, including copper.  
Prevents harmful build-up of carbonates.

A complete cleansing treatment: — No other purification measures necessary.

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**Sulphur Products Co. Inc.**  
228 McKeon Way  
Greensburg, Pa.

the Royal Plating & Polishing Co.

Mr. Donroe has been closely identified with the metal finishing industry and is closely associated with the activities of the American Electroplaters' Society.

#### Calby Joins Newark Office of Acheson Industries

Joseph W. Calby has joined the Newark office of *Acheson Industries, Inc.* as assistant to the technical director, *Raymond Szymanowitz*.

Following his graduation from Cornell University in June 1951, as a Bachelor of Chemical Engineering, Mr. Calby was employed until September 1953 by the Atlantic Refining Co., as an assistant chemical engineer in the Economic Evaluation Division. From December 1953 to September 1955, he was stationed at the Army Chemical Center, Maryland, as a group leader of piloting processes for the manufacture of toxic agents.

Mr. Calby attended Franklin and Marshall Academy in Lancaster, and the Mercersburg Academy in Mercersburg, Pennsylvania. He is married to the former Diana Heywood of Buffalo,



Joseph W. Calby

New York, and lives at Beech Spring Drive, Summit, New Jersey. Mr. Calby is a member of the American Institute of Chemical Engineers.

#### Taormina Appointed by N.A.M.F.

Appointment of *Silvio C. Taormina*, executive secretary, *Masters' Electroplating Assn.*, New York City, as technical advisor of the *National Association of Metal Finishers* has been an-

nounced by *John Palik, Jr.*, National Plating Corp., Cleveland, president of the association.

Mr. Taormina is widely known throughout the industry as a consultant and writer on both technical and managerial aspects of metal finishing.

#### More Nickel Diverted to Industry

A total of 1,100,000 pounds a month of premium price ferro-nickel and nickel ingot will be diverted in November and December to industry from scheduled shipments to the Government, the *Office of Defense Mobilization* announced recently. Premium price nickel is the only additional nickel available at this time for diversion to industry.

The decision to divert the nickel was made by *Arthur S. Flemming*, ODM director, after consultation with the *Defense Mobilization Board*.

The metal being diverted will slightly more than offset an anticipated increase in defense-rated orders. It is in addition to the 6,000,000 pounds already authorized for the two months and will bring to 23,950,000 pounds the total amount of nickel

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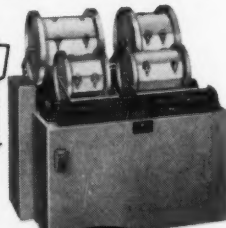
SPEED-D-BURR PRECISION BARREL FINISHING



Efficiently streamlined and designed. Offers exceptional versatility—and just exactly the right unit for any barrel finishing needs. Ideal for high production—or short runs, for large or small intricate parts. A unit for every size plant.

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FUTURAMA LINE • MEDIA • COMPOUNDS  
HANDLING EQUIPMENT

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PRECISION BARREL FINISHING EQUIPMENT & SUPPLIES



which will have been diverted to industry during 1955.

With this additional quantity the total amount available to non-defense consumers should be somewhat higher than in previous months. It will be offered by the producers at the price which would have been paid by the Government.

None of the nickel is to be released from the National stockpile.

### 25-Year Service Watches Awarded Three Wyandotte Chemicals Representatives

Shown above front row, left to right are three more *Wyandotte Chemicals, J. B. Ford Division* sales representatives who have earned 25-year service watches:

*Harry A. Conroy*, resident salesman in Kalamazoo, Mich.; *Roy M. Barnes*, resident salesman in Utica, N. Y. and *Emil Haas*, a New York City district salesman. Congratulating the new watch wearers were back row, left, *Fred Tholen*, sales manager who received his 25-year watch last year and *Ford Ballantyne, Jr.*, a Wyandotte



Chemicals vice-president and general manager of the J. B. Ford Division.

Nearly 900 of the more than 2,000 company employees who have received 25-year service watches are still in active service.

### Ampeco Appoints New Pump Distributors

The appointment of five new pump distributors has been announced by *Ampeco Metal, Inc.*, Milwaukee, Wis. The appointments are:

*Will Process Equip. Corp.*, Ro-

chester, N. Y.; *The Condit Co.*, Tulsa, Okla.; *A-L Machine and Equip. Co.*, Franklin Park, Ill.; *Rawdon Myers Agency*, Cincinnati, Ohio.; *Paul B. Duggan*, Chicago, Ill.

All are franchised to supply the new Series "D" centrifugal pumps and the established "Z" type as well as parts for both models. These pumps are designed to give high efficiencies in the moving of corrosive liquids under most conditions.

### Tumbling Sales & Service Co. Announces Change in Name

Effective as of October 15th the name of *Tumbling Sales & Service Co.* was changed to *The Esbec Barrel Finishing Corp.* The officers will be *Morris S. Shipley*, president and treasurer, and *William A. Biebel*, vice-president and secretary.

No change of ownership or location of office or plant is involved, and the new corporation will continue all the activities and policies of the former company.

The Esbec Tumbling Division in Meriden, Conn., will continue to operate under the same name, as a division of the new corporation.

## Looking for a BETTER FINISH?



## TAILOR-MADE BUFFING AND POLISHING COMPOUNDS

for Aluminium, Brass, Copper, Stainless Steel,  
Carbon Steel, etc.

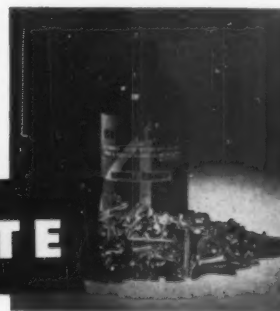
### CAKE, DIP AND SPRAY CEMENT AND THINNER

for setting up wheels, belts and rolls.

**HARRISON & COMPANY, INC.**  
HAVERHILL, MASSACHUSETTS

A barrel load of  
bright nickel  
with a nickel's  
worth of

## NICKELITE



## CORROSION RESISTANCE UP 30% TO 100%

With Nickelite you can get 13 to 22 hours of salt spray exposure with 0.00006 inch of barrel nickel, instead of 11 to 13 hours. Actual salt spray tests show even greater improvement with thicker deposits. And you're saving money, too!

### WRITE FOR FREE FOLDER ON MODERN BARREL PROCESSES



Concentrated to quadruple strength — you don't ship, store or handle water! Shipping weight cut 275% — no deposits, no carboy returns. Stable, efficient, easily stored, easily used — a capful of Nickelite is enough for a barrel load of nickel.

59 E. 4TH ST.

NEW YORK 3

### Victor Chemical to Produce Sodium Hypophosphite

Construction of a plant to provide sodium hypophosphite, required for electroless nickel plating processes was announced by Victor Chemical Works, major producer of phosphorus, phosphates and other industrial chemicals.

The new plant will be an addition to the firm's Nashville, Tenn., facilities, and is expected to go on stream February of 1956. It has been designed to permit rapid expansion as use of the new process spreads in the metal plating industries.

### Louis C. Sarelas Named New Sales Representative for American Buff

American Buff Co., Chicago, announces the recent appointment of Louis C. Sarelas as sales representative for the New England Area.

Mr. Sarelas has a broad background in industrial marketing and selling which includes responsible positions in management and merchandising to military post exchanges. He has been



Louis C. Sarelas

sales manager for manufacturers selling to the Government, sales promotion consultant, and most recently, Washington, D. C. representative for the S & K Sales Co. of New York City.

As a native New Englander, Mr. Sarelas is especially qualified to service buff users in that territory. He will locate in New England. Mr. Sarelas is married and has two children.

### Magnuson Products Corp. Elects Officers

At the annual meeting of the Board of Directors of Magnuson Products Corporation on Nov. 3, 1955 the following officers were elected for the ensuing year:

President — *Ingrid C. Magnuson.*

Executive Vice-President and Secretary — *Russell F. Burch.*

Treasurer — *Charles L. Novak.*

Asst. Secretary — *William F. Nickerson.*

Asst. Secretary — *Edward Magnuson, Jr.*

### Bart Laboratories Expands

Bart Laboratories Co., Inc., Belleville, N. J., announces the completion of a new plant to house their precision precious metals plating facilities. Now encompassing approximately 19,000 square feet of floor space, the new plant is located in adjacent North Newark, bounded by two railroads, easily accessible to major highways and the firm's sales-executive offices in Belleville.

### GUARANTEED BUFF CO., INC.

20 VANDAM STREET  
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SERVING THE FINISHING INDUSTRY FOR  
MORE THAN 50 YEARS

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**Complete Line of Guaranteed, Quality  
BUFFS & POLISHING WHEELS**

INCLUDING PATENTED, VENTILATED & BIASED

STRAIGHT & 45° "SPOKE-BUFFS"

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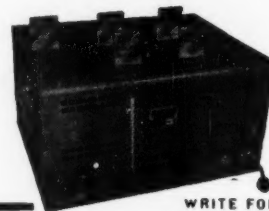


### IMPROVE YOUR PLATING WITH PERIODIC-REVERSE UNITS

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METABOND withstands severe and consistent flexing and bending without chipping or breaking bond.



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## Associations and Societies

### AMERICAN ELECTROPLATERS' SOCIETY

Shown here are members of the

Baltimore-Washington Convention Committee planning the 4rd Annual A.E.S. Convention: standing, 1 to r.—Wendell P. Barrows, entertainment; William Metzger, Jr., Outing; Dr. William Blum, Honorary Co-Chairman; Vincent J. Hughes, Jr., plant visitation; Kenneth M. Huston, co-chairman; Raymond Stricklen, public-

ity; Asaf A. Benderly, hotel; Jules Horelick, finance; seated, foreground, Vernon A. Lamb, banquet; 1 to r.—Dr. Abner Brenner, education; Fielding Ogburn, registration; Arthur G. Pierdon, co-chairman; Miss Ellen Pierdon, secretary; Mrs. Kenneth M. Huston, ladies; Mrs. Wendell P. Barrows, ladies; Mrs. Mary A. Pierdon, ladies chairman; Carl H. Thiede, program.

The 43rd Annual A.E.S. Convention will take place in Washington, D. C., June 17-21, 1956 with headquarters at the Hotel Statler.

### Pittsburgh Branch

The monthly meeting of the Pittsburgh Branch was held at the Sherwyn Hotel's Alleghany Room on October 5th. The meeting was preceeded by a fine dinner at which 24 attended. Charles Owens, by missing dinner, missed out on a free meal. A new innovation by the branch to stimulate attendance at dinners, two or three free meals each month, but winners have to be present to get the prize.

At the short business meeting we were pleased to welcome two new members into our branch, Sirwell E.



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**BRASS**



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**BRASS SOLUTIONS**

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PRODUCTION TESTS SHOW 25% TO 35% INCREASE  
IN WHEEL OR BELT LIFE

LEA GRIPMASTER offers other values, too. For example, it sizes as well as bonds. Its single grade bonds effectively a wide range of grit sizes. It's more flexible.

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(A member of the well known Lea Group of Finishing Specialists)



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Johnson and Earl Johnson Lord, A. John Cornish, Collin F. Stevens and Ty Nitsche. We were hosts to four guests for the evening. The proposed changes and additions to the Branch By-Laws were discussed and unanimously passed.

Since the branch president was indisposed the 1st. Vice-President *Myron Ceresa* handled the meeting. After the customary committee reports the meeting was turned over to Librarian *Jim Crain*. He introduced our speaker for the evening, *Edwin R. Bowerman* of Sylvania Electric Products, Inc., who talked on "Plated Wiring." This excellent talk in a new field of electroplating proved most interesting to the members as evidenced by the number of questions and especially the interest in the samples Ed displayed at the conclusion of his talk.

During the short pause for refreshments, Ed drew the name for the door prize. *Richard E. Woehrle* was the fortunate winner of a beautiful set of Revere Stainless Steel cooking bowls and pans (for his wife) presented by *Bob Burford* of Pennsalt.

*Herb Schram*  
Secretary

#### Central Michigan Branch

The Central Michigan Branch met on Tuesday, October 11, 1955 at the Hotel Hayes in Jackson. A letter of resignation was read from *R. L. Carter*, the president. Mr. Carter was

forced to resign from the A.E.S. because of a job transfer. Following dinner, the door prize was won by *Lenard Reiman* and a very interesting discussion between members and *R. W. Parker* of the Michigan Water Resources Commission took place. The discussion type of meeting allowed individual members to get answers to waste disposal problems that directly concerned them. Mr. Parker received a rising vote of thanks at the close of the meeting.

#### Indianapolis Branch

Even if the weather was very rainy, the membership of the Indianapolis Branch was well represented when fifty attended the November 2nd meeting at Fox Steak House. After the usual opening of introductions, secretary and treasurer's reports, the following were voted into the branch as new members:

*Robert H. Gwynn*, 3837 Broadway, Indianapolis; *Daniel E. Chegar*, 1013 N. Korby St., Kokomo; *Thomas N. Clark, Jr.* 1026 E. Wylie, Bloomington; *William V. Pitkin*, 2640 W. Minnesota St., Indianapolis; *William B. Spell*, 3660 S. Downey Ave., Indianapolis.

This motion was made by *Les Reynolds*, seconded by *Jack Vaughan* and carried. Mr. Clark, Pitkin and Spell were in attendance and were introduced to the group.

President, *Herb Kennedy*, reported on the Tri-State regional plans. Dis-

cussion followed about the by-laws and a motion made by Mr. Vaughan and second by *Tom Evans* that the Indianapolis Branch accept the by-laws with the Dayton Branch amendment. This motion was carried.

*Abraham Max* reported on the organization of a class in plating. Since it is late for a September class, we could consider organizing a class for mid-year or next fall. Several ideas came up and much discussion followed. Dr. Max will report later on this subject.

The 1956 meeting of the branch at Columbus, Ind. is being planned now and Mr. Evans is chairman. In a motion by *Elmer Lundberg* and seconded by *Frederick Anderson*, it was moved that up to \$150.00 be appropriated for a program if needed. This was carried.

The program for the evening was given by *Richard Hafer* of Reynolds Metal Company of Louisville, Ky. Mr. Hafer's topic was "Anodizing." Since this is a very large field in finishing at the present time, his talk was one of great interest.

After a brief introduction of the subject, he described the types of oxide films formed on aluminum. Process procedures were given along with coating thickness, abrasion resistance, corrosion resistance and strength of the film. Mr. Hafer showed many slides which were diagrams of the processes. Colored slides were included showing the many colors obtained in anodizing. Many questions were asked by the group and Mr. Hafer was very capable when it came to answering them.

The meeting adjourned at 10:00 P.M.

*Edna Rohrabough*  
Secretary

#### Buffalo Branch

*Harold A. Kahler*, assistant to the vice-president of Promat Division, Poor & Co., spoke at the November meeting of the Buffalo Branch. His subject was "Present Practices and Probable Trends in Cadmium Plating."

*Frank Rudolph* and *Hy Fudeman* were appointed delegates to the Niagara Frontier Technical Society. *Joseph Ruff* was appointed chairman and *Harold Day* to the sick committee.

Visitors were: *J. August*, Waukegan.

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In Canada: Canadian PERMAG Products, Ltd., Montreal

Ill.; *Don Blum*, Rochester, N. Y.; *H. Carlson*, Jamestown, N. Y.

*J. Scholterer* reported that everything is ready for the Christmas Party Dec. 2, 1955 at 9:00 P.M. There will be a gift for each lady. *Grag Simon's* orchestra will furnish the music. A buffet luncheon will be served.

Ticket committee are: *Charles Fotheringham*, *Ray Blechinger*, *Bert Kirchoff*, and *Si Bush*.

*Eric G. Sampson, Jr.*  
Secretary

### Los Angeles Branch

*James F. Carland*, executive vice-president and general manager of the *Chandeysson Electric Co.*, St. Louis, Mo., manufacturers of generators, was the featured speaker at the November 9 meeting of Los Angeles Branch, which was held in the form of an educational session, a business meeting, and a dinner at the *Rodger Young Cafe* on Washington Blvd., Los Angeles.

Mr. Carland presented a film showing various stages of construction and installation of the plating set-up for automobile bumpers at the *Livonia, Mich.*, *Chevrolet* plant of *General Motors Corp.*, which is reported to be the world's largest plating plant.

His talk was mainly in the form of commentary to the film which pictured various stages of progress during the installation of equipment. The film was amazingly complete in the detail of showing the progress of installation, from the time the plating building was an empty shell, to the hoisting in position of the huge 500 foot long copper, nickel and chromium tanks, and final views of the nearly complete installation. At the end of the film, Mr. Carland discussed some of the latest developments on "What's going on in Detroit in the plating field," and then presided over a question-and-answer period.

Branch president *Earl W. Arnold* presided at the initiation of two new members: *Noel Starck*, *Promat Division*, *Poor & Co.*, Los Angeles office; and *Stephen Martin*, *Pacific Semiconductors, Inc.*, *Culver City, Calif.* An application was received from *Lawrence R. Boutchard*, *Dow Chemical Co.*, Los Angeles, for processing at the December meeting.

Among the guests were two men prominent in eastern metal finishing circles, both of whom have settled in new positions in Southern California

and announced they will apply for membership transfer to Los Angeles Branch.

*Joseph Simon*, president of *Bridgeport, Conn.*, Branch who, until a few weeks ago, was associated with *Contract Plating Co.* in *Stratford, Conn.*, has joined the technical staff of *Librascope, Inc.*, *Glendale, Calif.*, as a material and process engineer. He revealed that he has already set the ball rolling to have his membership transferred to Los Angeles Branch. Joe attended his first A.E.S. meeting in California less than a week after he arrived there.

Also present at the November meeting was *Dr. Ralph Muraca*, formerly assistant professor of chemistry at *Lehigh University*, *Bethlehem, Pa.* Dr. Muraca is now active as a research engineer on jet propulsion in *Pasadena, Calif.*, and plans to transfer membership from *Allentown-Reading* to Los Angeles Branch.

Other guests who were introduced by Sergeant-at-arms *Pete Esten* included *Oscar Whiteman*, *Western Metal Finishers*; *Ike Baker*, *San Francisco* office of *Alert Supply Co.*; *C. F. Carlson* and *Kenneth Newman*, *Turco Products, Inc.*; *Frank Pickell*, *California Testing Labs.*; *Benton I. Jones*, *Precision Plating Co.*; and *Ralph Peters*, *Fleetline Plating Co.*

President Arnold called attention to a wave of burglaries involving the theft of nickel from various plating shops which swept the Southern California during the closing weeks of October and early weeks of November.

It was reported that at least six plating shops in the Los Angeles metropolitan area suffered losses in the form of nickel supplies and nickel anodes. Arnold warned shop owners to be on the alert for persons who come to their shops offering nickel at bargain prices.

### Central Michigan Branch

Members of Central Michigan Branch met on November 8, 1955 at *Hotel Porter* in *Lansing, Mich.* for dinner and business meeting. Following meeting we had a very fine talk from *J. S. Hesler*, *Industrial Filter and Pump Mfg. Co.* His subject was "Use of demineralizers for treating water for plating and for treating plating room waste." A spirited question and answer session followed the talk.

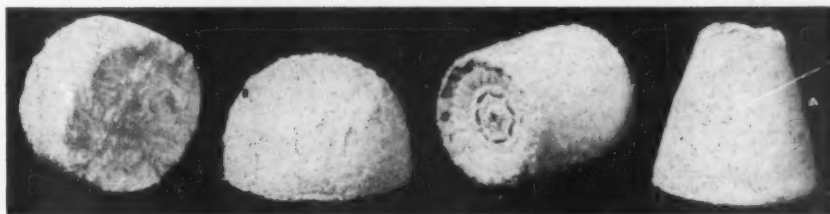
*G. S. Woodruff*

### Newark Branch

The October 21 meeting of Newark Branch was called to order by President *Tom Austin* with all officers present except *W. Grigat* and *John Gumm*. Tom reported plans well along for the Christmas Party on December 17th. *Dodd Carr* reported the *Electroplating School* moving along nicely with 41 registered and an attendance of 90-100% each evening.

*Dr. Fred Lowenheim* of *Metal and Thermit* chose as his "Timely Topic" *Tin Alloy Deposition*, particularly emphasizing the tin-copper (12-88%) alloy which he claimed better than copper under chromium, was almost as easy to plate as copper and almost

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as cheap. He mentioned that claims have been made that tin-copper bronze may be substituted mil for mil for nickel. Fred also briefly outlined the work on Section E of ASTM B-8 Committee concerned with performance of tin and tin alloy coatings. Corrosion will not be the first study; instead solderability is scheduled and first a solderability test is necessary.

C. S. Hague of the Westinghouse Electric Corp. discussed "Germanium Rectifiers." He first of all pointed out that available methods for transforming alternating current to direct current had limitations, electronic tubes (11-12 volt drops), mechanical (new and many problems), selenium and copper oxide rectifiers (poor life and efficiency), motor generators (costly and require maintenance). He stated the new germanium rectifier had high efficiency, long life and low maintenance. Mr. Hague compared the normal conductor with the semi-conductor and pointed out the function of impurities in semi-conductors and the extreme purity of semi-conductor materials. The preparation of pure germanium (zone refining and single

crystal formation) the formation of p and n type junctions (indium and antimony introduction) and the mechanism whereby germanium junctions work. Present junctions are available at 20 amperes at 32 volts and these may be combined to yield any d.c. output desired, e.g. 24 junctions yield a rectifier rated 4,000 amperes at 24 volts.

A number of questions after the formal talk directed to both speakers indicated the general interest of the more than fifty present in the two subjects.

D. Gardner Foulke  
Secretary

M. F. S. A.



The Metal Finishing Supplier's Association, Inc., 83 Parmalee Ave., Hawthorne, N. J., announces the following committees for the ensuing year:

Executive and Finance: Ray Ledford, Chairman—Industrial Filter &

Pump Mfg. Co., Chicago; Moss Cherry—George L. Nankervis Co., Detroit; Henry McLeese—United Chromium Div., Metal & Thermit Corp., New York; Manson Glover—Glover Coating Co., Malden, Mass.

Legislative Committee: Mervin M. Beckwith, Chairman—Harshaw Chemical Co., Cleveland; H. J. McCracken—Northwest Chemical Co., Detroit; L. A. Davies—Davies Supply & Mfg. Co., St. Louis.

Sub-Committee — Strategic Materials: Hank Nice, Chairman—Harshaw Chemical Co., Cleveland; Joe Wagner—Wagner Brothers, Inc., Detroit; Fred Green—Crown Rheostat & Supply Co., Chicago; Gus Munning—Munning & Munning, Inc., Newark.

Membership Committee: George Stutz, Chairman—George A. Stutz Mfg. Co., Chicago; Don Barrett, Roto Finish Co., Kalamazoo, Mich.; Art W. L'Hommedieu—Chas. F. L'Hommedieu & Sons Co., Chicago.

Program Committee: Sperm Goble, Chairman—Federated Metals Div., A. S. & R. Co., New York; Augie Hoefer—Frederic B. Stevens, Inc., Detroit; Barney Reynolds—Reynolds Co., Philadelphia; Harry Irvin—Allied

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Constitution and By-Laws: Manson Glover, Chairman—Glover Coating Co., Malden, Mass.; Chas. Berry—Maas & Waldstein Co., Chicago; Mel. Morris—Circo Equipment Co., Rahway, N. J.

Resolutions Committee: Ben Sax, Chairman—American Buff Co., Chicago; F. G. Sterling—Newark Brush Co., Kenilworth, N. J.; Bill Fotheringham—W. M. Fotheringham, Inc., Buffalo.

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Sub-Committee — Credit Information: Bill Belke, Chairman—Belke Manufacturing Co., Chicago; Al Pay-

son—Michigan Buff Co., Detroit; Harvey Levine—Plating Equipment & Supply Co., New York; Gerry McCray—Eaton Chemical & Dyestuff Co., Detroit.

Public Relations Committee: Dave Clarin, Chairman—Oakite Products Co., New York; Gene Combs—Diamond Alkali Co., Cleveland; Kergan Wells—W. W. Wells, Ltd., Toronto, Canada.

Nominations Committee: Ezra Blount, Chairman—Products Finishing, Cincinnati; Jim Carland—Chandeysson Electric Co., St. Louis; Harold Kahler—Promat Div., Poor & Co., Waukegan, Ill.

Golf Committee: Joe Duffy, Jr., Chairman—Pennsylvania Salt Mfg. Co., Philadelphia; John Gumm—Frederick Gumm Chemical Co., Kearny, N. J.; Bob Burford—Pennsalt Chemicals, Pittsburgh, Pa.

Liaison Convention Committee  
Chairmen: Joe Duffy—Pennsylvania Salt Mfg. Co.—Washington Convention 1956; Jeff Carrique—Alloycraft Ltd. — Montreal Convention 1957;

Chuck Wise—The Buckeye Products Co. — Cincinnati Convention 1958; Dee Mosher—Lee of Michigan—Detroit Convention 1959.

## AMERICAN ZINC INSTITUTE, INC.

E. F. Lundeen, assistant superintendent of quality control, Inland Steel Co., Chicago was the recipient on Nov. 10 of the Annual Award of The Galvanizers Committee which held its thirty-third meeting at the Drake Hotel. A gold wrist-watch, suitably inscribed, was presented to Mr. Lundeen in recognition of distinguished service to the committee and to the galvanizing division of the steel industry.

Mr. Lundeen is a graduate of Carnegie Institute of Technology with a B.S. degree in metallurgical engineering. Before joining Inland Steel in 1941 he was a metallurgist with A. C. Spark Plug and General Motors, research engineer with Willard Storage

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Mr. Lundeen has served as chairman of the Program Subcommittee of The Galvanizers Committee for the past two years. He is chairman of the American Iron and Steel Institute Technical Committee on Sheets and a member of the General Technical Committee, chairman of several committees of American Society for Testing Materials and a member of the Board of Directors, and a member of the Society of Automotive Engineers.

The Galvanizers Committee which is sponsored by the American Zinc Institute presents an award each year in recognition of distinguished service and valuable contributions to the galvanizing industry or related field, the recipient to be selected by the Council of The Galvanizers Committee

which represents the sheet and pipe galvanizers in the United States and Canada.

## NATIONAL ASSOCIATION OF METAL FINISHERS

The *National Association of Metal Finishers*, recently re-organized to represent job-shop finishing companies from coast to coast, has announced its sponsorship of a management seminar in Chicago. The seminar will be held at the Conrad Hilton Hotel on Friday and Saturday, January 27th and 28th, 1956, in conjunction with the annual educational sessions of the Chicago Branch, A.E.S.

The program for the event will include a banquet on Friday evening, with sessions both on Friday afternoon and on Saturday. Featured in the program will be two conference sessions during which attendees will have the opportunity to discuss their individual plant problems with a variety of guest experts from all phases of management.

A charge of ten dollars per person will include the cost of the banquet and the entire program. Invitations to the event will be sent to owners and operators of job-shop finishing firms throughout the country and to managers of finishing departments of manufacturing firms. Attendance is limited to these groups.

## News from California

By Fred A. Herr



In its second major expansion during the past eight months, Sunset Plating Co., operated at 432 North Varney St., Burbank, Calif., by *Art Habits*, has installed some \$25,000 worth of new equipment for precision metal plating, chromic acid anodizing, and non-ferrous electropolishing.

To the gold and silver still and barrel plating facilities installed in March, 1955 for finishing electronics items, Habits recently added one new gold and one new silver tank, and a rhodium tank. He also has set up a complete new department for printed circuitry plating in conjunction with the precious metal division. To supplement the gold, silver and rhodium tanks, Habits installed a new 500 gallon fluoboric acid tank and a 300 gallon tin fluoroborate tank.

Main shop facilities have been enlarged by replacing a holdover 1,200 gallon chromic acid anodizing tank with a new 15' x 5' x 5', 2,500 gallon tank, and a 500 gallon electropolishing tank for use with non-ferrous metals in connection with a special government job which the firm is handling. The shop's power facilities have been enlarged through a new 500 ampere generator. A new control laboratory adjoins the precision metal department and is equipped for complete analyses and quality control of solutions and finished work. *Henry Sakland* is supervisor of precious metal plating, and *Justin Kilgore* laboratory director.

*Cecil Brigham*, vice-president of Richardson-Allen Corp., Flushing, N. Y., was a visitor in Los Angeles in Los Angeles in mid-October. In addition to interviewing applicants for the post of Southern California service engineer for R-A rectifiers, electronics and other products, Mr. Brigham conferred with the heads of Sundmark Supply Co., Los Angeles, distributors of R-A rectifiers.

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*2.4-3.9 pH	8.6-10.0 pH
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\*Electrometric Values in Nickel Solutions.

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**Walt Husband**, partner in the C.&W. Metal Finishing Co., Los Angeles, reports that plans are under way for adding some 6,500 square feet of factory area to the firm's present plating plant at 3525 South Greenwood St.

A 40 x 160 foot factory building adjoining the firm's present 13,000 square foot finishing plant has been acquired and is expected to be fully equipped by early spring. Major new equipment will include an automatic polishing machine for decorative work and additional tank facilities to supplement present copper, nickel and chromium equipment.

Recently installed was an automatic polishing machine for use on plumbing fixtures. The operators of C.&W. regard their facilities as the largest production job shop on the West Coast. They process no single items, only large production jobs, plus some defense work. The bulk of their work is in the field of small plumbing items, such as flanges, cross-heads, wheel handles, etc. When the addition is in operation, Walt reported, the plant's production capacity will be approximately 20,000 items per day.

Roto Finishing Systems has moved factory and office from 720 Olive St., Compton, Calif., to larger quarters at 1501 South Alameda St., same city. The new setup provides owner **Fred Gunter** with a fireproof, one-story building of 3,000 square feet floor area for his operations dealing with the design and production of conveyorized graining machines, vertical and horizontal edge banders, and horizontal self-drive units for use on heavy paper or metal in rolls. Gunter established the firm two years ago after a tenure of service with Schultz Machinery Co., Compton.

The Engelberg Huller Co. of Syracuse, N. Y., manufacturers of abrasive belt machines, has appointed **J. D. Kraeger** as west coast sales engineer, with headquarters in Los Angeles. Kraeger was formerly a machinery salesman for Fred C. Paulsen Co., Los Angeles. His territory will include the states of California, Arizona, Washington, Oregon, Idaho and Nevada.

Anchor Machinery Corp., manufacturers of abrasive belt machines and

grinders, has moved from 229 West Orange Grove Ave., Burbank, Calif., to more extensive factory quarters at 432 Victory Blvd., also in Burbank. Owner **Sheldon Strauss** has also issued a new colored brochure on the firm's super-speed belt grinder, bench model pedestal grinder, and dust collector.

**Melesio Perez** of the Rheem Automotive Co.'s Los Angeles plating department, and Mrs. Perez, visited their birthplaces in Mexico on his recent vacation. They flew from Tia Juana to Guadalajara, visited Mrs. Perez' hometown of Esatlan, and also made a stop at Zacatecas and San Juan de las Lagos. Melesio reported that a bit of excitement developed, inbound to Guadalajara, where the plane ran into a storm and rode airpockets like a Texas bronco.

**Dexter J. Tight**, industrial adviser to W. P. Fuller Co., of San Francisco, retired recently, bringing to a close a career marked by outstanding contributions to the industrial paint and coating industry of the United States. He had been associated with the manufacture of paint as a chemist and business man since 1912. Mr. Tight was perhaps most widely known for his pioneering work in the field of wood and automobile lacquers, and in developing the Nason electric color mixer.

**Ike Baker** and **Jim Hodges**, Alert Supply Co. sales engineers, respective-

ly in the San Francisco and Los Angeles areas, switched jobs, effective Nov. 1. Ike, who has been representing **Arthur Gaskin's** and **Al Perkins'** firm in San Francisco for the past year, has been transferred to the Los Angeles area, and has been replaced by **Jim Hodges**, who has covered Southern California for the firm for the past year or so.

**James F. Carland**, executive vice-president, Chandeysson Electric Co., St. Louis, Mo., was in Los Angeles on a business trip recently for conferences with **A. D. Gaskin** and **Alford Perkins** of Alert Supply Co., Chandeysson distributors on the West Coast.

**Leo Missel** reports that he has resigned from Menasco Mfg. Co., Burbank, Cal., where he served as a finishing engineer, to join the staff of Lockheed Aircraft Corp.'s Missile System Division in Van Nuys, Cal., as a research engineer.

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Brass Balls — To Specifications.

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# INDEX TO VOLUME 53 — METAL FINISHING

JANUARY-DECEMBER, 1955

(Compiled by N. Hall, Editor, and I. Oquendo, Edit. Ass't.)

In this index all material that appeared in the January through December 1955 issues of *Metal Finishing* is listed according to subject matter, with cross references where required. Following each listing will be found a letter indicating the manner in which the material was published, as follows:

- |                                       |                               |
|---------------------------------------|-------------------------------|
| (S)—Shop Problem                      | (M)—Manufacturers' Literature |
| (R)—Recent Development                | (T)—Technical Literature      |
| (P)—Patent                            | (L)—Letters to the Editor     |
| (A)—Abstracts from Foreign Literature |                               |

Any reference not followed by a letter was a feature article. The numbers in the right-hand column refer to the month and page numbers; 6-85 means June issue, page 85, etc.

## ABRASIVES, BELTS—See Polishing

## ACID DIPPING—See Bright Dipping and Pickling

## AGITATION

Tank Rod Agitator (R) ..... 2- 90

## ALLOY PLATING

Immersion Brass on Steel (S) ..... 1- 84  
 Brass Color on Steel (S) ..... 1- 86  
 Brass Solution (P) ..... 2- 81  
 Studies on Electrodeposited Alloys (A) ..... 2- 82  
 Red Gold Alloy Plating (A) ..... 4- 72  
 Red Gold Alloy Plating (A) ..... 4- 73  
 Bath Conditions with Gold Plating (A) ..... 5- 70  
 Bright Brass Finish (S) ..... 5- 78  
 Electroplated Tin-Copper and Tin-Lead Deposits (A) ..... 5- 78  
 Electroplated Tin-Zinc and Tin-Nickel Alloys (A) ..... 6-106  
 Cobalt-Iron-Nickel Bath (S) ..... 6-122  
 Tin-Nickel Alloy Plating (A) ..... 7- 51  
 Bronze Plating: Why and How ..... 8- 71  
 White Brass Bath (P) ..... 9- 98  
 Bath Control Conditions with Tin-Nickel Alloy Plating (A) ..... 9-111  
 Non-Tarnishing White Plate (R) ..... 10- 47  
 Copper-Tin-Zinc Plating ..... 10- 66  
 Bright Copper and Brass (S) ..... 11- 82  
 Hamilton Gold (S) ..... 11- 88  
 Characteristics of Tin-Nickel Plated Alloy Coatings (A) ..... 12- 69  
 Tungsten and Vanadium Baths (S) ..... 12- 72  
 Preventing Silver Tarnish (S) ..... 12- 72

## ALUMINUM

Coloring Aluminum Black (P) ..... 1- 88  
 Sealing Anodized Aluminum (P) ..... 1- 89  
 Degreasing Layouts for Aluminum Treatment for Light Metal Semi-Products (A) ..... 1- 90  
 Aluminum Coating (M) ..... 1-104  
 Anodizing Hollow Objects ..... 2- 61  
 Surface Treatment and Finishing of Light Metals ..... 2- 66  
 Wood Nickel Solution (S) ..... 2- 73  
 Brass Color on Aluminum (S) ..... 2- 73  
 Electropolishing Aluminum (P) ..... 2- 75  
 Anodizing and Coloring Aluminum (P) ..... 2- 77  
 Surface Treatment and Finishing of Light Metals ..... 3- 73  
 Anodizing Aluminum (P) ..... 3- 84  
 Hot-Dip Aluminum (P) ..... 3- 86  
 Bright Dipping Aluminum (P) ..... 3- 86  
 Method of Bonding Aluminum to Steel (P) ..... 4- 67  
 Method of Producing Decorated Aluminum Articles (P) ..... 5- 73  
 Surface Treatment and Finishing of Light Metals ..... 6- 91  
 Aluminum Electroforming (P) ..... 6-111  
 Hard Anodizing Aluminum (P) ..... 6-111  
 The Adhesion and Corrosion of Electroplated Aluminum (A) ..... 6-120  
 Degreasing of Aluminum and Aluminum Alloys (A) ..... 6-122

## Coating with Aluminum from the Vapor

Phase (A) ..... 6-123  
 Finishes for Aluminum (M) ..... 6-160  
 Sealing Anodized Aluminum (P) ..... 7- 69  
 Hot Dip Aluminum (P) ..... 7- 71  
 The Ematal Process (A) ..... 7- 72  
 Coloring Anodized Aluminum (M) ..... 7-100  
 Surface Removal with Chemical and Anodic Polishing of Reflectal and Pure Aluminum (A) ..... 8- 73  
 Surface Treatment and Finishing of Light Metals ..... 9- 69  
 Hot Dipping Aluminum (P) ..... 9- 93  
 Comparison of Results with Chemical and Electrolytic Polishing of Aluminum (A) ..... 9- 97  
 Aluminum Polishing Processes (A) ..... 9- 97  
 Stripper for Anodized Aluminum (R) ..... 9- 99  
 Perforated Metal Anodizing Basket (R) ..... 9-100  
 Anodized and Dyed Aluminum Strip (R) ..... 9-104  
 Chromate Coating for Aluminum (R) ..... 9-106  
 Anodized Aluminum Tester (R) ..... 9-114  
 Silver Plating Aluminum Bus Bars ..... 10- 44  
 Surface Treatment and Finishing of Light Metals ..... 10- 52  
 Anodizing Aluminum (S) ..... 10- 65  
 Chromic Anodizing Specifications (S) ..... 10- 65  
 Anodizing Aluminum (P) ..... 10- 71  
 Stripper for Zinc Chromate Primers on Aluminum (R) ..... 10- 82  
 Black Finish for Aluminum (R) ..... 10- 91  
 Surface Treatment and Finishing of Light Metals ..... 11- 74  
 Chromic Acid Anodizing (S) ..... 11- 82  
 Bright Dip for Aluminum (P) ..... 11- 84  
 Cleaning Aluminum (P) ..... 11- 84  
 Hot Dip Aluminum (P) ..... 12- 73  
 Aluminum Coated Articles (P) ..... 12- 75  
 Cadmium Plated Aluminum (P) ..... 12- 75  
 Chemical Polishing of Aluminum (A) ..... 12- 76  
 Aluminum Pipe and Fittings (M) ..... 12- 97

## ANALYSIS—See Testing

## ANODES

Anodes for Rhodium Plating (S) ..... 4- 66  
 Electrodeposition of Copper (P) ..... 4- 69  
 Method of Electroplating (P) ..... 6-117  
 Versatile Anodizing Rack ..... 7- 63  
 Round Lead Anodes (R) ..... 9- 99  
 Aluminum Cored Lead Anodes (R) ..... 9-110

## ANODIZING

Sealing Anodized Aluminum (P) ..... 1- 89  
 Anodizing Hollow Objects ..... 2- 61  
 Anodizing and Coloring Aluminum (P) ..... 2- 77  
 Test Equipment for Anodized Coatings (A) ..... 2- 82  
 Anodizing Aluminum (P) ..... 3- 84  
 Method of Producing Decorated Aluminum Articles (P) ..... 5- 73  
 Surface Treatment and Finishing of Light Metals ..... 6- 91  
 Hard Anodizing Aluminum (P) ..... 6-111  
 Sealing Anodized Aluminum (P) ..... 7- 69  
 The Ematal Process (A) ..... 7- 72  
 Coloring Anodized Aluminum (M) ..... 7-100  
 Surface Treatment and Finishing of Light Metals ..... 9- 69  
 Stripper for Anodized Aluminum (R) ..... 9- 99  
 Perforated Metal Anodizing Basket (R) ..... 9-100

Anodized and Dyed Aluminum Strip (R) ..... 9-104  
 Anodized Aluminum Tester (R) ..... 9-114  
 Surface Treatment and Finishing of Light Metals ..... 10- 52  
 Anodizing Aluminum (S) ..... 10- 65  
 Chromic Anodizing Specifications (S) ..... 10- 65  
 Anodizing Aluminum (P) ..... 10- 71  
 Surface Treatment and Finishing of Light Metals ..... 11- 74  
 Chromic Acid Anodizing (S) ..... 11- 82  
 Plating Within Limits ..... 12- 65  
 Refrigeration Unit (R) ..... 12- 87

## AUTOMATIC EQUIPMENT

Work Transfer Device (P) ..... 1- 87  
 Film on Automatic Barrel Plating (M) ..... 1-105  
 Strip Plating Apparatus (P) ..... 5- 73  
 Automatic Plating Machine (R) ..... 5- 80  
 Automatic Continuous Proportional Metering Systems (R) ..... 5- 88  
 Cleaning Machine (R) ..... 5- 89  
 Pretreating Equipment (M) ..... 5- 93  
 Wire Plating Machine (P) ..... 6-115  
 Mechanical Finishing Machine (R) ..... 6-134  
 Conveyor Chain Brusher (R) ..... 6-135  
 Great Flexibility a Feature of New Automatic Plater ..... 8- 45  
 Automatic Plater (R) ..... 9- 99  
 Continuous Roll Vacuum Metallizer (R) ..... 9-101  
 Plating Plant Installation (M) ..... 10-107  
 Automatic Bright Dipping Machine (M) ..... 10-109  
 Electroplating Systems (M) ..... 10-110  
 Wire Plating Contact Finger (P) ..... 12- 74

## BARREL FINISHING—See Tumbling

## BARREL PLATING

Variable Speed Plating Barrel with Automatically Timed Reversing Control (R) ..... 1- 96  
 Plating Barrels (R) ..... 1- 99  
 Film on Automatic Barrel Plating (M) ..... 1-105  
 Barrel Nickel Plating (S) ..... 2- 73  
 Plating Barrels (R) ..... 2-101  
 Barrel Plating (M) ..... 2-126  
 Barrel Nickel Plating of Steel Balls (A) ..... 3- 89  
 Anodes for Rhodium Plating (S) ..... 4- 66  
 Pressure in Plating Barrels (S) ..... 6-106  
 Chromium Plating Barrels (R) ..... 6-130  
 Midjet-Size Plating Barrel (R) ..... 6-142  
 Tapered Lucite Plating Barrel (R) ..... 8- 77  
 Double Oscillating Cylinder for Barrel Plating (R) ..... 9-102  
 Small Lot Plating Barrels (R) ..... 10- 79

## BLAST CLEANING

Abrasive Blasting (P) ..... 2- 75  
 Abrasive Blasting (R) ..... 2- 99  
 Self-Contained Blast Unit (R) ..... 2-100  
 Collapsible Valve for Sandblast Hose (P) ..... 3- 84  
 Abrasive Blasting (P) ..... 3- 87  
 Dustless Blasting Shot (R) ..... 3- 98  
 Die Casting Finishing by Abrasive Blasting (M) ..... 3-128  
 Sandblast Machines (M) ..... 4- 97  
 Dustless Mineral Shot for Blast Cleaning (M) ..... 4- 97  
 Matte Chromium Finish (S) ..... 5- 70  
 Blast Cleaning (M) ..... 5- 94  
 Abrasive Blasting (P) ..... 6-108  
 Sandblast Nozzles (R) ..... 9-114  
 Liquid Blast Cleaning (M) ..... 9-137  
 Automatic Wet Blast Machine (R) ..... 10- 91

Abrasive Blasting (M)	10-109
New Bulletin on Table-Type Blast Cleaning Machine (M)	11-133

## BRASS PLATING—See Alloy Plating

## BRIGHT DIPPING

Bright Dipping Aluminum (P)	3- 86
Bright Dipping Lead (P)	4- 69
Bright Dip for Steel (S)	5- 70
Bright Dip for Stainless Steel (P)	6-112
Chemical Brightening of Brass and German Silver—Composition of the Brightening Bath (A)	7- 72
Surface Removal with Chemical and Anodic Polishing of Reflectal and Pure Aluminum (A)	8- 73
Lacquer Adhesion on Bright Dipped Brass (S)	9- 89
Comparison of Results with Chemical and Electrolytic Polishing of Aluminum (A)	9- 97
Automatic Bright Dipping Machine (M)	10-109
Bright Dip for Aluminum (P)	11- 84
Chemical Polishing of Aluminum (A)	12- 76
Chemical Brightening of Colored Metals (A)	12- 76
Zinc Bright Dip (R)	12- 80

## BRIGHTENERS

Bright Cyanide Zinc Bath (P)	1- 87
Bright Zinc Process (R)	1- 96
Bright Zinc Process (R)	1- 99
Bright Nickel (P)	2- 77
Bright Nickel Plating (P)	2- 79
Bright Acid Copper (S)	3- 80
Nickel Bath (P)	5- 73
Cyanide Copper Bath (P)	5- 73
Bright Nickel (P)	6-112
Bright Copper Plating Bath (P)	6-113
Bright Acid Copper (P)	7- 69
Acid Copper Brighteners (R)	7- 74
Acid Copper Plating (P)	8- 69
Bright Acid Copper (P)	8- 70
Bright Gold Bath (P)	9- 93
Cadmium Fluoroborate Bath (P)	9- 94
Bright Copper Bath (P)	10- 69
Addition Agents for Zinc Plating (R)	10- 76
Liquid Cadmium Brightener (R)	11- 98
Acid Copper Bath (P)	12- 74
Acid Copper Bath (P)	12- 75

## BUFFING—See Polishing

## BURNISHING—See Tumbling

## CADMIUM PLATING

Salt Spray Corrosion of Cadmium	4- 48
Cadmium Fluoroborate Bath (P)	9- 94
Removing Magnafux Dye (S)	10- 65
Liquid Cadmium Brightener (R)	11- 98
Cadmium Plated Aluminum (P)	12- 75

## CHEMICALS

Oxidizing Liquid (M)	1-103
Chemicals (M)	1-103
Barrel Finishing Compound (R)	2- 86
Alkaline Powder for Rust, Scale, Paint Removal (R)	2-101
Highly Stabilized Safety Solvent (R)	3- 96
Metal Finishing Chemicals (M)	3-125
Chlorothene Solvent (M)	3-124
Surface Active Agents (M)	3-124
Pickling Aids (M)	3-125
Heavy Duty Cleaner (M)	3-125
Rust Preventives (M)	3-128
Detergent Compositions (P)	4- 69
Copper Cyanide (R)	4- 74
Corrosion Inhibitors (R)	4- 82
Industrial Chemicals (M)	4- 95
Pocket Book of Chemical Technology (B)	4-114
Combination Cleaner-De-ruster (R)	5- 83
Low-Foaming Surfactant (M)	6-159
Vapor Phase Inhibitors (M)	6-159
Carbonate Remover (R)	7- 76
New Type Silica (R)	7- 76
Chlorinated Solvents (M)	7- 98
Basic Alkali Chemicals (M)	7- 99
Silicone Defoamers (M)	7-100
Emulsion Cleaner (P)	8- 71
Vapor Degreasing Solvent (R)	9-115
Metal Treatments (M)	9-134
Chlorinated Solvents (M)	9-135
Industrial Solvent (R)	10- 86
Barrel Finishing Compounds and Media (R)	11- 93
Liquid Compound to Keep Steam Cleaners Free of Lime (R)	11-100
Soda Ash (M)	11-133
Process Equipment (M)	12- 97

## CHROMIUM PLATING

Pipe and Fittings for Chromic Acid (S)	1- 84
Iron in Chromium Solutions (S)	1- 84

## The Adhesion of Hard Chromium Deposits

(A)	1- 92
Use of Hard Chromium Plating in Hydraulic Engineering (A)	1- 93
The Strength of Hard Chromium Plated Steels (A)	1- 93
Applications of Hard Chromium Plating in the Tile Making and Terra-Cotta Industries (A)	1- 94
Classical Working Procedures for Hard Chromium Plating (A)	1- 95
Cold Chromium Plating Without Nickel Undercoat (A)	1- 95
Direct Chroming Without Nickel Undercoat (A)	1- 95
Hard Chromium Services (M)	1-104
Spot Plating Chromium (P)	2- 81
Hard Chromium (R)	2- 91
Chromium Plating (P)	3- 86
Excess Sulfuric Acid in Chromium Plating Bath (A)	3- 88
Standardization of Chromium Bath Tests on a Bent Cathode in the Hull Cell	5- 50
Complex Ions in Chromium Plating Solutions	5- 56
White Chromium Deposits (S)	5- 70
Matte Chromium Finish (S)	5- 70
Stripping Hard Chromium (S)	5- 71
Standardization of Chromium Bath Tests on a Bent Cathode in the Hull Cell	6- 99
Chromium Plating Crankshafts (S)	6-106
Chromium Thickness Testing (S)	6-107
Chromium Bath (P)	6-115
Chromium Plating Barrels (R)	6-130
Crack-Free Chromium Plating Process (R)	6-140
Oil Derrick Marks Chromium Tank	7- 59
Electroless Chromium	7- 62
Method of Making Chrome Plated Piston Rings (P)	7- 69
Chromic Acid Spray Control (R)	7- 75
Hard Chromium Plating of Needles—Racking Problems (A)	8- 74
Hard Chromium (P)	9- 93
Round Lead Anodes (R)	9- 99
Chromium Bath (P)	10- 69
Addition Agent for Chromium Bath Throwing Power (R)	10- 84
Chromium Plating Processes (R)	10- 85
Crack-Free Chromium (M)	10-109
Chromium Plating Chinaware (S)	11- 82
Chromium Plating Crankshafts (S)	12- 72
Self-Regulating Chromium Plating Bath (A)	12- 78
Cold Chromium Plating Baths (A)	12- 79

## CLEANING

Refinishing Pewter (S)	1- 84
Peeling Nickel Plate (S)	2- 74
Paste Soap Dispenser (R)	2- 86
Mold Cleaning Machine (R)	2- 90
Emulsion Cleaner-Degreaser (R)	2- 94
Metal Cleaning (M)	2-126
Electrolytic Cleaning (P)	3- 85
Heavy Duty Cleaner (M)	3-125
Detergent Compositions (P)	4- 69
Pitted Copper Plate (S)	5- 70
Metal Cleaning Pad (P)	5- 72
Silver Cleaning and Polishing Composition (P)	5- 73
Combination Cleaner-De-ruster (R)	5- 83
Stainless Steel Cleaner and Passivator (R)	5- 87
Cleaning Machine (R)	5- 89
Non-Tarnishing Copper Cleaner (P)	6-108
Degreasing of Aluminum and Aluminum Alloys (A)	6-122
Principles of Emulsion Technology (B)	6-176
Metal Cleaning Bibliographical Abstracts (B)	6-176
Washing Machine (P)	7- 71
Cleaner-Stripper Compound (R)	7- 78
Washing Machine for Drums (R)	7- 83
Cleaning Platinum (P)	8- 67
Cold Cleaning Compound Also Acts as Rust Inhibitor (R)	8- 79
Detergent for Oily Soils (R)	8- 84
Fingerprint Remover (M)	8- 99
Removing Magnafux Dye (S)	10- 65
Silver Plating Brass (S)	11- 82
Engine Carbon Removal (P)	11- 84
Liquid Compound to Keep Steam Cleaners Free of Lime (R)	11-100
Cleaning Machine (R)	12- 80
Cold Cleaners (R)	12- 82
Antiseptic Hand Soap (R)	12- 82
Cleaning Equipment and Materials (M)	12- 94

## COLOR BUFFING—See Polishing

## COLORED SURFACE TREATMENTS

Blue Color on Steel (S)	1- 84
Coloring Metals Black (P)	1- 87
Coloring Aluminum Black (P)	1- 88
Oxidizing Liquid (M)	1-103
Brass Color on Aluminum (S)	2- 73
Hardware Finish (S)	2- 74
Anodizing and Coloring Aluminum (P)	2- 77
Metal Coloring by Electrodeposition of Interference Thin Film: Part I Determination of Coloring Conditions (A)	2- 83

Ormolu Gold Finish (S)	3- 81
Black Finish on Bronze (A)	6-122
Coloring Anodized Aluminum (M)	7-100
Oxidizing Compound (M)	9-135
Black Finish for Aluminum (R)	10- 91
Antique Colors on Brass (A)	11- 87
Quality Tests for Black Oxide Coatings on Steel	12- 48
Oxidize for Brass and Silver (S)	12- 69

## COMPOSITIONS

Buffing Compound (P)	1- 87
Polishing Lubricant (P)	3- 87
Buffing Compound for Stainless Cutlery (R)	6-126
New Type Silica (R)	7- 76
Polishing and Buffing Compounds (M)	7- 99
Polishing Compositions Containing Silicone Oils (A)	8- 75
Buffing Compound (R)	8- 80
Buffing and Finishing Compounds (M)	10-108

## CONVERSION SURFACE TREATMENTS

A Survey of Chromate Treatments	1- 80
Developments in Phosphating Techniques (A)	1- 90
Chemical Protective Treatment for Tinplate Sheet (A)	1- 90
The Protecta Tin Process (A)	1- 91
Alkali Metals in Phosphating and Cyanide Plating Baths	2- 58
Surface Treatment and Finishing of Light Metals	2- 66
Conversion Coating (R)	2- 86
Surface Treatment and Finishing of Light Metals	3- 73
Phosphate Coating Material (R)	3- 95
Phosphate Conversion Coating (R)	3-101
Salt Spray Corrosion of Cadmium	4- 48
Phosphate Coating Retention During Cold Extrusion of Artillery Shells	4- 56
Phosphate Conversion Coating (M)	4- 95
Phosphate Conversion Coatings (M)	5- 92
Conversion Coating (P)	6-108
Phosphate Conversion Coating (P)	9- 93
Chromate Coating for Aluminum (R)	9-106
The Cr-22 Coating for Magnesium	12- 57

## COPPER PLATING

Copper Plate for Carburizing (S)	1- 84
Bright Acid Copper (S)	3- 80
Copper Plating Steel Wire (P)	3- 87
Masking for Heavy Copper Plate (S)	4- 65
Electrodeposition of Copper (P)	4- 69
Copper Cyanide (R)	4- 74
Pitted Copper Plate (S)	5- 70
Pitted Acid Copper Deposit (S)	5- 71
Cyanide Copper Bath (P)	5- 73
Copper on Silicon (S)	6-107
Bright Copper Plating Bath (P)	6-113
Plating Over Electroless Nickel (S)	7- 67
Bright Acid Copper (P)	7- 69
Acid Copper Brighteners (R)	7- 74
Acid Copper Plating (P)	8- 69
Bright Acid Copper (P)	8- 70
Roughness on Plating with High Current Densities—Causes and Prevention (A)	8- 73
Refinishing Bumpers (S)	9- 88
Immersion Copper (P)	9- 94
Bright Copper and Brass (S)	10- 66
Bright Copper Bath (P)	10- 69
Acid Copper Bath (P)	12- 74
Acid Copper Bath (P)	12- 75

## CORROSION PREVENTION

Rust Inhibiting Composition (P)	1- 87
Rust Preventive Oil Composition (P)	1- 88
Oxidation Prevention (P)	1- 88
Treatment of Silver to Inhibit Tarnishing (P)	2- 80
Corrosion Inhibitor (P)	2- 80
Corrosion Inhibiting Composition (P)	2- 80
Resin Protective Coating (R)	3- 95
Hot Spray Vinyl Paint (R)	3- 96
Protective Coatings (R)	3- 97
Rust Preventives (M)	3-128
Heat and Rust Resistant Black (S)	4- 65
Salt Water Resistance (S)	4- 66
Rust-Preventive Compositions (P)	4- 67
Corrosion Preventive Composition (P)	4- 68
Corrosion Inhibitors (R)	4- 82
Rust Preventive Compositions (P)	6-117
Anti-Tarnish Paper (R)	6-142
Vapor Phase Inhibitors (M)	6-159
Rust Preventives (M)	6-160
Tarnishing of Gold Plate (S)	7- 67
Tarnish of Silver and Gold Deposits (S)	7- 67
Corrosion Inhibiting Composition (P)	8- 71
Cold Cleaning Compound Also Acts as Rust Inhibitor (R)	8- 79
Anti-Corrosion Coatings (M)	8- 98
How Zinc Controls Corrosion (M)	8-100
Silver Tarnish Prevention (P)	9- 91
Corrosion Preventive (P)	10- 70
Corrosion Prevention (P)	11- 86
Resistant Gold Finishes (S)	12- 69

Preventing Silver Tarnish (S) .....	12- 72
Corrosion Preventive (P) .....	12- 74
Acid Resisting Floor Sealer (R) .....	12- 93

## COSTS AND GENERAL

Technical Developments of 1954 .....	1- 58
Source of Patents (S) .....	2- 73
Finishing Costs (S) .....	2- 73
Electroplating Engineering Handbook (B) .....	2-125
Engineering Metallurgy (B) .....	3-113
Metals Handbook—1954 Supplement (B) .....	4- 40
Do's and Don'ts in Plating Operations .....	4- 62
Science for Electroplaters .....	4- 67
Cladding Metal (P) .....	4- 70
Impact Plating (P) .....	4- 95
Products and Plating Processes (M) .....	4-114
Pocket Book of Chemical Technology (B) .....	4-114
Dictionary of Metallography (B) .....	5- 59
Plating Bath Control: Past, Present and Future .....	5- 67
Science for Electroplaters .....	5- 97
Finishing Handbook & Directory (B) .....	6-103
Science for Electroplaters — IV .....	6-137
Polyethylene Floats (R) .....	6-139
Floor Patch (R) .....	6-158
Corrosion Proof Construction (M) .....	6-160
Plastic Equipment (M) .....	6-166
Protective Coatings for Metals (B) .....	7- 64
Science for Electroplaters — V .....	7- 76
Corrosion-Proof Flooring Material (R) .....	7-101
Consulting Services (B) .....	8- 62
Science for Electroplaters — VI .....	8- 89
Metal Industry Handbook & Directory (B) .....	9- 86
Science for Electroplaters — VI .....	10- 62
Science for Electroplaters — VII .....	10-107
Technical Chart (M) .....	11- 60
The Structure of Electrodeposited Metals .....	11- 70
Electroplating on Porous Metal .....	11- 78
Science for Electroplaters .....	11-102
Chemical Engineering Materials (B) .....	11-102
Process Engineering Economics (B) .....	11-102
Transactions Institute Metal Finishing (B) .....	11-102
Engineering Metallurgy (B) .....	12- 60
The Structure of Electrodeposited Metals .....	12- 66
Science for Electroplaters — Solutions — Equations .....	12- 69
Plating Costs (S) .....	12- 98
Handbook of Engineering Materials (B) .....	

## DEGREASING

Metal Cleaning with Emulsions (A) .....	1- 90
Degreasing Layouts for Aluminum Treatment for Light Metal Semi-Products (A) .....	1- 90
Degreaser Cleanout Indicator (R) .....	1- 97
Vapor Spray Degreasers (M) .....	1-103
Metal Cleaning with Ultrasonics .....	2- 63
Vapor Degreaser (R) .....	2- 94
Multi-Crystal Ultrasonic Generator (R) .....	2- 95
Drum Type Vapor Degreaser (R) .....	3-102
Highly Stabilized Safety Solvent (R) .....	3- 96
Chlorothene Solvent (M) .....	3-124
Vapor Degreasing Equipment (M) .....	4- 97
Vapor Degreasing (M) .....	4- 98
Determination of Oil in a Vapor Degreaser .....	5- 66
Pitted Copper Plate (S) .....	5- 70
Organic Solvents (R) .....	5- 90
Safety Solvent (R) .....	7- 74
Ultrasonic Degreasers (R) .....	7- 74
Chlorinated Solvents (M) .....	7- 98
Emulsion Cleaner (P) .....	8- 71
Heavy Duty Vapor Degreaser Features .....	8- 83
Special Sludge Pump (R) .....	8- 84
Detergent for Oily Soils (R) .....	9-115
Vapor Degreasing Solvent (R) .....	9-135
Chlorinated Solvents (M) .....	10- 67
Solvent Degreaser (P) .....	10- 83
Solvent Vapor Degreaser (R) .....	10- 86
Industrial Solvent (R) .....	11- 99
Compact Laboratory Degreaser (R) .....	12- 82
Cold Cleaners (R) .....	12- 84
Solvent Still (R) .....	12- 92
Automatic Degreaser for Hot or Cold Operation (R) .....	12- 94
Cleaning Equipment and Materials (M) .....	12- 97
Solvent Recovery (M) .....	

## DE-IONIZATION—See Water

## DESCALING—See Pickling

## DRYING

Centrifugal Dryer (R) .....	9-104
-----------------------------	-------

## ELECTROCLEANING—See Cleaning

## ELECTROFORMING

Electroforming (P) .....	1- 89
Electroformed Masks (S) .....	3- 80
Record Stampers (S) .....	4- 65
Electroformed Injection Molds (S) .....	4- 66
Manufacture of Metal Articles by Electrodeposition (P) .....	5- 72
Electroforming (P) .....	6-108
Aluminum Electroforming (P) .....	6-111
Electroformed Dies (P) .....	8- 67
Printed Circuits (P) .....	8- 69

Electroformed Stencils (S) .....	9- 88
Electroforming Screens (P) .....	9- 91
Electroforming Low Stress Nickel (P) .....	12- 73

## ELECTROPOLISHING

Electropolishing Aluminum (P) .....	2- 75
Electropolishing Zinc (P) .....	2- 80
Electropolishing Brass (S) .....	3- 80
Electropolishing "Nimonic 80" .....	5- 64
Electropolishing of Stainless Steel Table Knife Blades with Phosphoric-Sulfuric Acid Mixture (A) .....	5- 97
Chemical Polishing Solution and Method (P) .....	6-108
Electropolishing (P) .....	6-111
Electropolishing (P) .....	6-115
Electrolytic Polishing Method (P) .....	6-117
Surface Removal with Chemical and Anodic Polishing of Reflectal and Pure Aluminum (A) .....	8- 73
Electropolishing of Stainless Steel Knife-blades in Perchloric Acid Bath (A) .....	9- 95
Comparison of Results with Chemical and Electrolytic Polishing of Aluminum (A) .....	9- 97
Aluminum Polishing Processes (A) .....	9- 97
Electropolishing Silver (S) .....	12- 72
Electropolishing (A) .....	12- 76

## ETCHING—See Pickling

## FILTERS AND PUMPS

Centrifugal Pump (R) .....	1- 96
Porous Fluorocarbon Filter (M) .....	1-103
Filter Cloths (M) .....	1-104
The Use of Filters in Electroplating .....	2- 52
Filter Units (R) .....	2- 86
Seal-Less Pumps (R) .....	2- 94
Laboratory Model Filter (R) .....	3-103
Porous Teflon Filter Media and Filters (M) .....	3-125
"Canned Rotor" Pump Design (M) .....	3-128
Centrifugal Pumps (R) .....	4- 83
Filtration (M) .....	4- 96
Teflon Filter Cloth (M) .....	4- 97
Chemical Pumps (M) .....	4- 98
Filter for Alkaline Solutions (R) .....	5- 80
Filter (R) .....	5- 82
Distilled Water Bottle Pump (R) .....	5- 83
Chemical Process Pumps (R) .....	5- 86
Solution Filter (R) .....	5- 88
Automatic Continuous Proportional Metering Systems (R) .....	5- 88
Pressure Filter (M) .....	5- 94
Chemical Pump (M) .....	5- 94
Filter for Corrosive Solutions (R) .....	6-124
Rotary Pumps (R) .....	6-128
Solution Filter (R) .....	6-129
Porous Stainless Steel Water Filters (R) .....	6-131
Air Pump (R) .....	6-136
Sump Filter Pumps (R) .....	6-136
Dehumidifier for Compressed Air Systems (R) .....	6-138
Solution Filters (M) .....	7- 98
Water Filters (M) .....	7- 99
Filter Plant Gauges (M) .....	7-100
Controlled Volume Pumps (M) .....	7-101
Pumping Heat Exchanger (M) .....	7-101
Dynel Filter Felt (R) .....	8- 81
New Features Added to Horizontal Filters (R) .....	8- 86
Glass Fiber Filter Discs (M) .....	9-135
High Vacuum Pumps (M) .....	9-136
Getting the Most Out of Centrifugal Pumps .....	10- 57
Tubular Filters (R) .....	10- 76
New Porous Teflon and Kel-F Filters (R) .....	10- 86
Canned Rotor Pump (R) .....	11- 95
Distilled Water Bottle Pump (M) .....	11-133
Filters—Construction and Operation .....	12- 51
Speed Lock Cover for Filters (R) .....	12- 80
Portable Air-Motor Pump (R) .....	12- 91
High Temperature Pump (R) .....	12- 93
Solution Filters (M) .....	12- 96

## FIRST AID—See Safety Procedures & Equipment

## GAS PLATING

Diffusion Coating (P) .....	1- 88
Impregnation of Steel Surfaces with Molybdenum from the Gaseous Phase (A) .....	1- 91
Gas Plating (P) .....	2- 75
Gas Plating (P) .....	2- 81
Gas Plating (P) .....	3- 84
Gas Plating (P) .....	3- 85
Gas Plating (P) .....	5- 72
Gas Plating (P) .....	5- 73
Coating of Steel Surfaces with Tungsten from Chloride Atmospheres (A) .....	5- 77
System of Gas Plating (P) .....	6-113
Coating with Aluminum from the Vapor Phase (A) .....	6-123
Gas Plating (P) .....	7- 71
Gas Plating (P) .....	8- 67
Vapor Plating (B) .....	8- 88
Gas Plating (P) .....	9- 91
Gas Plating (P) .....	10- 67
Gas Plating (P) .....	10- 70

Gas Plating (P) .....	11- 84
Gas Plating Apparatus (P) .....	11- 84
Gas Plating (P) .....	12- 75

## GENERATORS—See Power Supplies

## GRINDING—See Polishing

## HANDLING EQUIPMENT

Work Transfer Device (P) .....	1- 87
Hand Lift Trucks (M) .....	1-103
Chemical Feed Control Unit (R) .....	3- 90
Automatic Rinse Water Control (R) .....	3- 98
Polyethylene Bottles and Jars (R) .....	3-100
Re-Usable Containers (M) .....	3-127
Pretreating Equipment (M) .....	5- 93
Small Parts Handling (M) .....	5- 93
Stainless Steel Baskets (R) .....	6-126
High Lift Truck (R) .....	6-138
Barrel Hook (R) .....	6-139
Dip Tank Magnet (R) .....	8- 84
Polyethylene Bottle Carriers (R) .....	8- 87
Perforated Metal Anodizing Basket (R) .....	9-100
Barrel Finishing Separator (R) .....	9-109
Tape Applicator (R) .....	10- 86
Automatic Parts Transfer (R) .....	10- 88
Gravity Conveyor (R) .....	11- 97
All-Steel Drop Bottom Box (R) .....	11- 97
Palm-Coated Jersey Gloves (R) .....	12- 85
Chip Bins (R) .....	12- 85
Corrosion-Resistant Fabricated Alloy Products (M) .....	12- 95

## HEATING METHODS AND EQUIPMENT

Distilled Water Heater (R) .....	2- 88
Graphite Heat Exchanger (R) .....	2- 91
15 H.P. Scotch Steamboiler (R) .....	2- 92
Quartz Thermostat (R) .....	2-101
Graphite Heat Exchanger (R) .....	2-101
Solution Heaters (R) .....	3-101
Heat Exchangers (M) .....	3-124
Use of Steam for Heating (M) .....	3-126
Automatic Reset Thermostat Relay (R) .....	4- 81
Furnace and Oven Controls (M) .....	5- 93
Heater for Vacuum Metallizing Apparatus (P) .....	6-116
Heat Exchangers (R) .....	6-131
Fused Quartz Radiant Heaters (M) .....	6-157
Feedwater Heater (R) .....	7- 75
High Temperature Bath (R) .....	7- 80
Cooling Control (M) .....	7- 99
Pumping Heat Exchanger (M) .....	7-101
Thermodynamic Steam Trap (R) .....	8- 81
Small Deaerating Heater (M) .....	8-100
Pneumatic Temperature Control (R) .....	9-107
Electro Heating of Solutions (M) .....	9-134
Heat Exchanger (R) .....	10- 90
Bucket Steam Trap (R) .....	11- 92
"U" Type Quartz Immersion Heater (R) .....	11- 95
Plate Coil Data and Prices (M) .....	12- 94
Submerged Combustion Equipment (M) .....	12- 96

## HOT DIP COATINGS

Comparison Between Hot Dip Tin and Electroplated Tin Sheets (A) .....	1- 91
Aluminum Coating (M) .....	1-104
Hot Dip Coating (P) .....	3- 85
Hot Dip Aluminum (P) .....	3- 86
Method of Bonding Aluminum to Steel (P) .....	4- 67
Tin Coatings on Ferrous and Non-Ferrous Metals (A) .....	5- 76
Tests of Electrolytic Tinplates for Canned Foods (B) .....	5- 97
Carriage for Removing Articles from a Galvanizing Bath (P) .....	6-116
Hot Galvanizing (P) .....	6-117
Flowing Tin Plate (S) .....	7- 67
Hot Dip Aluminum (P) .....	7- 71
Dross Remover (P) .....	8- 69
Hot Dipping Aluminum (P) .....	9- 93
Hot Galvanizing (P) .....	10- 67
Hot Galvanizing (P) .....	10- 70
Continuous Hot Galvanizing of Strip .....	11- 67
Hot Dip Aluminum (P) .....	12- 73
Hot Galvanizing (P) .....	12- 74
Aluminum Coated Articles (P) .....	12- 75

## HYDROGEN EMBRITTLEMENT

Embrittlement of Steel by Hydrogen During Electroplating (A) .....	8- 74
Scale Removal and Embrittlement (S) .....	9- 90

## IMMERSION PLATING

Immersion Brass on Steel (S) .....	1- 84
Nickel Plate on Steel (S) .....	3- 80
Electroplated Versus Electroless Nickel (L) .....	3-128
Electroless Nickel (S) .....	4- 65
Formation of Reflecting Coatings (P) .....	5- 72
Electroless Nickel (P) .....	5- 72
Analysis of Hypophosphite (P) .....	6-109



Electroless Nickel (P) .....	6-111
Electroless Nickel (P) .....	6-112
Electroless Chromium .....	7- 62
Electroless Nickel Deposition .....	8- 59
Quicking Process (S) .....	8- 65
Immersion Copper (P) .....	9- 94
Electroless Nickel Process (M) .....	10-107

## INHIBITORS

Inhibited Acids in Plating Cycles .....	3- 60
Pickling Aids (M) .....	3-125
Acid Inhibitors (S) .....	6-106
New Pickling Bath Inhibitors (A) .....	6-123
Acid Pickling Inhibitor (P) .....	12- 75

## INSTRUMENTS, INDUSTRIAL

Indicating Temperature Control (R) .....	2- 99
Chemical Feed Control Unit (R) .....	3- 90
Automatic Rinse Water Control (P) .....	3- 98
Automatic Continuous Proportional Me- tering Systems (R) .....	5- 88
Furnace and Oven Controls (M) .....	5- 93
Electric Tachometers (M) .....	5- 94
Line-Operated pH Meter (R) .....	6-128
Factory Packaged pH System (R) .....	7- 76
Non-Destructive Thickness Tester (R) .....	8- 77
Adapter for pH Meters (R) .....	8- 84
Portable Brinell Hardness Tester (R) .....	8- 85
Surface Tension Testing (M) .....	8- 97
Process Control Instruments (M) .....	8- 99
Coating Thickness Tester (P) .....	9- 94
Controls for Zeolite Softeners (R) .....	9-105
Pneumatic Temperature Control (R) .....	9-107
Anodized Aluminum Tester (R) .....	9-114
Glossmeter (R) .....	9-114
Automatic Valve Positioner (M) .....	9-135
Instruments for Surface Measurement (M) .....	9-136
Temperature Instruments (M) .....	9-137
Glass Electrodes for pH (R) .....	10- 82
Controls for Waste Treatment (M) .....	10-108
Strip-Chart Recorders (M) .....	10-108
Industrial pH Guide (M) .....	10-108
New Electronic Humidity Controller (R) .....	11- 90
Surface Roughness Comparator (R) .....	11- 94
Short Cycle Electroplating Timers (R) .....	11- 96
Battery-Operated pH Meter (M) .....	11-133
Flowmeters of Direct Flow Design (R) .....	12- 84
Electrode Cell for Use in Solution Control (R) .....	12- 88
Control Panel for Water Treatment (M) .....	12- 95
Process Equipment (M) .....	12- 97

## IRON PLATING

Record Stampers (S) .....	4- 65
Monel Pickling Hooks (R) .....	4- 77
Building-Up Worn Machine Parts with Iron Plating (A) .....	5- 76
Hard Iron Plating (A) .....	11- 89
Iron Plated Chromium (P) .....	12- 73

## LEAD PLATING

Testing Porosity of Lead Deposits (S) .....	5- 70
---	-------

## MAGNESIUM

Anodizing Hollow Objects .....	2- 61
Pickling Treatments for Magnesium Metals (A) .....	2- 84
Pickling Magnesium Alloys (A) .....	6-119
The Cr-22 Coating for Magnesium .....	12- 57

## METALLIZING

Plating Non-Conductors (P) .....	2- 75
Conducting Coating (P) .....	2- 79
Metallizing of Non-Conducting Materials (A) .....	3- 89
Spray Metallizing (R) .....	4- 76
Printed Circuits (S) .....	5- 71
Pitted Acid Copper Deposit (S) .....	5- 72
Formation of Reflecting Coatings (P) .....	6-115
Silver Firing Paint (P) .....	7- 69
Metal Spraying (P) .....	8- 59
Electroless Nickel Deposition .....	8- 69
Printed Circuits (P) .....	9- 76
Methods of Coating Plastics with Metal .....	9- 91
Metal Spraying (P) .....	9- 91
Metallizing Non-Conductors (P) .....	11- 82
Chromium Plating Chinaware (S) .....	11- 82
Metallizing Ceramic (P) .....	12- 73

## NICKEL PLATING

Wood Nickel Solution (S) .....	2- 73
Barrel Nickel Plating (S) .....	2- 73
Peeling Nickel Plate (S) .....	2- 74
Bright Nickel (P) .....	2- 77
Bright Nickel Plating (P) .....	2- 79
Spectrographic Determination of Nickel and Cobalt Contents in Bright Nickel Baths (A) .....	2- 82
X-Ray Examination of Electrodeposited Bright Nickel (A) .....	2- 82
Raising pH in Watts Nickel Bath (S) .....	3- 80
Nickel Plate on Steel (S) .....	3- 80
Barrel Nickel Plating of Steel Balls (A) .....	3- 89

## Electroplated Versus Electroless Nickel

(L) .....	3-128
Electroless Nickel (S) .....	4- 65
Nickel Bath (P) .....	5- 73
Use of Nickel Strike (S) .....	6-106
Analysis of Hypophosphite (P) .....	6-109
Electroless Nickel (P) .....	6-111
Electroless Nickel (P) .....	6-112
Bright Nickel (P) .....	6-112
Electrodeposition of Nickel from Fluorobor- ate Solutions .....	7- 44
Brittle Hard Nickel (S) .....	7- 67
Significance of "Secondary" Inhibition for the Electroplating of Nickel (A) .....	7- 72
Electrodeposition of Nickel from Fluorobor- ate Solutions .....	8- 53
Electroless Nickel Deposition .....	8- 59
Zinc Determination in Nickel Solution (S) .....	8- 66
Roughness on Plating with High Current Densities—Causes and Prevention (A) .....	8- 73
Electrodeposition of Nickel from Fluorobor- ate Solutions .....	9- 79
Refinishing Bumpers (S) .....	9- 88
Plating Over Nickel (S) .....	10- 65
Dull Nickel Finish (S) .....	10- 66
Electroless Nickel Process (M) .....	10-107
Electroforming Low Stress Nickel (P) .....	12- 73

## ORGANIC COATINGS—STOPOFFS

Plastic Closures (M) .....	1-105
Liquid Neoprene Coating (R) .....	2- 95
Acid-Proof Concrete Coating (R) .....	2- 96
Corrosion Resistant Paint (R) .....	2- 98
Die-Cut Pressure-Sensitive Tapes (R) .....	2- 99
Resin Protective Coating (R) .....	3- 95
Hot Spray Vinyl Paint (R) .....	3- 96
Protective Coatings (R) .....	3- 97
Protective Coatings (M) .....	4- 98
Spray Vinyl Coating (R) .....	5- 90
Protective Coatings (R) .....	6-129
Neoprene Based Coating (R) .....	6-132
Anti-Rust Paint (R) .....	6-133
Vinyl Protective Coating (R) .....	6-142
Lacquers for Vacuum Metallizing (M) .....	6-159
Resin Coating Trial Kit (R) .....	7- 80
Corrosion Resistant Coatings (R) .....	8- 77
Black Crepe Paper Masking Tape (R) .....	8- 82
Plastic Fabrications (M) .....	8- 98
Anti-Corrosion Coatings (M) .....	8- 98
Lacquer Adhesion on Bright Dipped Brass (S) .....	9- 89
Acid-Proof Coating for Concrete (R) .....	9-108
Flooring Material (R) .....	9-112
Wax for Sealing Metal Coatings (R) .....	10- 83
Zinc Base Coating (R) .....	11- 92
Rubber Coated Parts Chart (M) .....	11-132
Scaling Porous Materials (S) .....	12- 69
Zinc Pigmented Paint (R) .....	12- 90
Plastics for Corrosion-Resistant Applica- tions (R) .....	12- 98

## OXIDIZING—See Colored Surface Treat- ments

## pH

Electrometric pH Determinations (B) .....	2-125
Raising pH in Watts Nickel Bath (S) .....	3- 80
pH Papers (R) .....	5- 82
Line-Operated pH Meter (R) .....	6-128
Glass Electrodes for pH .....	10- 82
Industrial pH Guide (M) .....	10-109
Battery-Operated pH Meter (M) .....	11-133

## PHOSPHATE COATINGS—See Conver- sion Surface Treatment

## PICKLING

Refining Pewter (S) .....	1- 84
Descaling and Pickling Titanium .....	2- 65
Pickling Treatments for Magnesium Metals (A) .....	2- 84
Alkaline Powder for Rust, Scale, Paint Removal (R) .....	2-101
Inhibited Acids in Plating Cycles .....	3- 60
Continuous Pickling Stainless Steel .....	3- 68
Ferric Chloride Etching Solutions (P) .....	3- 84
Pickling Aids (M) .....	3-125
Spray Pickling (M) .....	3-128
Tarnish Removal (S) .....	4- 65
Monel Pickling Hooks (R) .....	4- 77
Rust Removal (P) .....	5- 73
Pickling Process (P) .....	5- 75
Combination Cleaner-De-ruster (R) .....	5- 83
Use of Nickel Strike (S) .....	6-106
Acid Inhibitors (S) .....	6-106
Pickling Process (P) .....	6-108
Recirculation of Waste Pickle Liquor (P) .....	6-109
Pickling Ferrous Metals (P) .....	6-113
Descaling Titanium (P) .....	6-117
Pickling Magnesium Alloys (A) .....	6-119
New Pickling Bath Inhibitors (A) .....	6-123
Monel for Pickling (M) .....	6-158
Pickling Manganese-Copper Alloy (S) .....	7- 68
Testing Pickling Baths (P) .....	7- 69
Ultrasonic Descaling and Plating (R) .....	7- 81
Method of Pickling Iron and Recovering Pickling Agent (P) .....	8- 69

Etching Stainless Steel (S) .....	9- 88
Pickling Gold-Filled Parts (S) .....	9- 90
Scale Removal and Embrittlement (S) .....	9- 90
Cleaning Aluminum (P) .....	11- 84
Acid Pickling Inhibitor (P) .....	12- 75

## PIPING & FITTINGS, NOZZLES, VALVES

Pipe and Fittings for Chromic Acid (S) .....	1- 84
Plastic Pipe, Fittings and Valves (M) .....	1-105
Collapsible Valve for Sandblast Hose (P) .....	3- 84
Plastic Fabrications (R) .....	3- 96
Automatic Rinse Water Control (R) .....	3- 98
Design and Construction of Acid-Proof Trenches (M) .....	3-123
Rubber Lining Tanks, Valves, Fittings (M) .....	3-125
Plastic Pipe and Fittings (M) .....	3-126
Plastic Valves and Fittings (M) .....	3-128
Steam and Water Mixer (R) .....	4- 79
Pinch Type Valves for Automatic Control (R) .....	4- 82
Teflon Packing (R) .....	6-131
Flexible Tip Blow Gun (R) .....	6-137
Compressed Air Handbook (M) .....	6-157
Polyethylene Fittings and Pipe (R) .....	8- 85
Plastic Fabrications (M) .....	8- 98
Acid Hose (R) .....	9-107
Pinch Valves (R) .....	9-107
Stainless Steel Globe Valves (M) .....	9-137
Fittings for Polyethylene Pipe (R) .....	10- 79
Fiberglass Reinforced Pipe (R) .....	10- 86
Graphite Pipe, Fittings and Valves (M) .....	10-110
Bucket Steam Trap (R) .....	11- 92
Aluminum Pipe and Fittings (M) .....	12- 97

## PITTING, PEELING, BLISTERING

Plating Over Nickel (S) .....	10- 65
-------------------------------	--------

## PLANT PRODUCTION METHODS

Electroplating for Shelf Life .....	3- 64
Method and Apparatus for Plating Pipe .....	4- 68
Oil Derrick Marks Chromium Tank .....	7- 59
Plating Crankshafts (P) .....	11- 86
Internal Plating of Tubes (P) .....	11- 86
Wire Plating Contact Finger (P) .....	12- 74

## PLASTICS—See Organic Coatings and Metallizing

## PLATING MISCELLANEOUS METALS

Oxidation Prevention (P) .....	1- 88
Influence of an Alternating Current Com- ponent on the Current Distribution in Galvanic Electrolytes (A) .....	1- 90
Antimony Bath (P) .....	2- 77
Inhibited Acids in Plating Cycles .....	3- 60
Electroplating for Shelf Life .....	3- 64
Plated Wire (P) .....	4- 69
Electroplating of Germanium (P) .....	5- 73
Preplated Metals (M) .....	5- 94
The Adhesion and Corrosion of Electro- plated Aluminum (A) .....	6-120
Hard Gold Deposits (R) .....	6-124
Plating Wall Chart (M) .....	6-158
Bipolar Plating Process (M) .....	7- 98
Spot Plating Apparatus (P) .....	8- 67
Selective Plating (R) .....	10- 88
Selective Plating (M) .....	10-108
Transactions Institute Metal Finishing (B) .....	11-102
Electrodeposition of Titanium (P) .....	12- 73

## POLISHING, BUFFING, ETC.

Sand Bobbing (S) .....	1- 84
Buffing Compound (P) .....	1- 87
Scale Removal from Sheets (P) .....	1- 87
Abrasive Belt (P) .....	1- 89
Brush (P) .....	1- 89
Buff Arbor Press (R) .....	1-101
Belt Polisher (P) .....	2- 75
Adaptors for Abrasive Wheels (R) .....	2- 86
Abrasive Belt Lubricant (R) .....	2- 92
Backstand Idler (R) .....	2- 96
Conveyorized Belt Polisher (R) .....	2- 97
Abrasives and Polishing (M) .....	2-127
Method of Deburring and Finishing (P) .....	3- 84
Polishing Lubricant (P) .....	3- 87
Flatware Polisher (R) .....	3- 90
Sheet Cleaning Machine (R) .....	3- 97
Belt Grinder (R) .....	3- 99
Polishing Machines (M) .....	3-124
Abrasive Band Wheels (M) .....	3-126
Polishing and Grinding with Coated Abrasives (M) .....	3-127
Buffing Wheel (P) .....	4- 67
Budget Priced 6" Belt Sander (R) .....	4- 74
Automatic Feed Polishing Machine (R) .....	4- 78
Silver Cleaning and Polishing Composi- tion (P) .....	5- 73
Brushing Machine (P) .....	6-112
Polishing Abrasive (P) .....	6-116
Composition Applicator (R) .....	6-126

Buffing Compound for Stainless Cutlery (R)	6-126
Double Roll Polisher (R)	6-128
Mechanical Finishing Machine (R)	6-134
Abrasive Wheel (R)	6-135
Polishing Head (R)	6-138
Abrasive Belt Polisher (R)	6-141
Rubber Bonded Polishing Wheel (R)	6-143
Storing Coated Abrasives (M)	6-158
Rubber-Cushioned Abrasives (M)	6-161
Coated Abrasives Film (M)	6-161
Buffing Wheel (P)	7- 69
Polishing Disks (P)	7- 71
Metal Polishing Compositions Containing Silicones (A)	7- 72
New Type Silica (R)	7- 76
Contour Polishing Wheel (R)	7- 79
Mechanical Finishing Machine (R)	7- 82
Bench Grinder for Light Grinding (R)	7- 82
Polishing Backstand (M)	7- 98
Polishing and Buffing Compounds (M)	7- 99
Polishing Machine (P)	8- 67
Contour Polishing Machine (P)	8- 67
Polishing Compositions Containing Silicone Oils (A)	8- 75
Buffing Compound (R)	8- 80
Rubberized Abrasives Kit (R)	8- 83
Sisal Buff Selector (M)	8- 96
Blade Polishing Machine (P)	9- 91
Brush and Brush Material (P)	9- 94
Treated Sisal Buffs (R)	9- 99
Buffing Wheel (P)	10- 67
Abrasive Wheel (P)	10- 67
Abrasive Pad (P)	10- 69
Practical Considerations of Immersion Buffing and Polishing Techniques (A)	10- 71
Belt Polishing Techniques (A)	10- 73
Buffing and Polishing Materials (A)	10- 74
Air-Cooled Bias Buff (R)	10- 84
Resin Bonded Abrasive Wheels (R)	10- 87
Polishing Wheel (R)	10- 88
Air-Cooled Bias Buffs (M)	10-107
Buffing and Polishing Machines (M)	10-107
Buffing and Finishing Compounds (M)	10-108
Finishing Zinc Base Die Castings (M)	10-111
Composite Brush (P)	11- 84
Buff Construction (P)	11- 84
Extra Strong Abrasive Wheels for Portable Grinders (R)	11- 90
Flexible Abrasive Wheels (R)	11- 91
Mandrel Mounted Bobs (R)	11-100
Finishing Stainless Steel (M)	11-133
Rotary Brush (P)	12- 73
Polishing Machines (M)	12- 96

## POROSITY

Testing Porosity of Lead Deposits (S)	5- 70
Electroplating on Porous Metal	11- 70

## POWER SUPPLIES

Periodic Reverse Plating (P)	1- 87
Influence of an Alternating Current Component on the Current Distribution in Galvanic Electrolytes (A)	1- 90
Selenium Rectifiers (R)	1- 98
28 Volt, 300 Ampere Rectifier (R)	1-100
Generator Brushes (R)	1-102
Periodic Reverse Unit (R)	2- 91
Automatic Cut-Off Switch (R)	2- 92
Armored Motors (M)	2-126
Power Supply Bulletin (M)	2-127
Automatic Cut-Off Switch (M)	3-125
Motor Operated Tap Switch (R)	4- 74
Germanium Rectifiers (R)	5- 81
Liquid-Cooled Germanium Rectifier (R)	5- 83
Explosion-Proof Fractional HP. Motor (R)	5- 88
Electrical Control Devices (M)	5- 92
Motor Buying Information Catalog (M)	5- 94
Selenium Rectifiers (R)	6-124
Germanium Power Rectifiers (R)	7- 80
1000 Amp. Germanium Plater (R)	8- 80
Ultrasonic Cleaning Equipment (M)	8- 98
Rectifiers for Multi-Load Use (S)	9- 88
Alternating Current Ripple (S)	9- 88
Selenium Rectifiers (M)	9-134
Germanium Rectifiers (M)	9-134
Silver Plating Aluminum Bus Bars	10- 44
Carbon Pile Tank Rheostat (R)	10- 81
Germanium Rectifiers (R)	10- 84
Ultrasonic Generators (R)	10- 85
Germanium Rectifiers (M)	12- 95

## PRECIOUS METAL PLATING

Removal of Silver from Gold Bath (S)	1- 86
Electroplated Palladium, Platinum (M)	1-104
Gold Engraving on Guns (S)	2- 74
Red Gold Alloy Plating (A)	2- 83
Ormolu Gold Finish (S)	3- 81
Anodes for Rhodium Plating (S)	4- 66
Red Gold Alloy Plating (A)	4- 72
Bath Conditions with Gold Plating (A)	4- 73
Platinum Plating (A)	6-118
Tarnishing of Gold Plate (S)	7- 67
Tarnish of Silver and Gold Deposits (S)	7- 67
Gold Plating (S)	8- 65
Indium Bonded Lubricant (P)	8- 71
Bright Rhodium Plating (M)	8- 97
Rhodium Plating (P)	9- 91
Bright Gold Bath (P)	9- 93

Ormolu Metal (S)	10- 65
Hamilton Gold (S)	11- 82
Resistant Gold Finishes (S)	12- 69

## PUMPS—See Filters and Pumps

## RACKS AND RACK COATINGS

Masks and Rack Coats (R)	5- 82
Protective Caps and Plugs (R)	5- 87
Rack Coating (M)	5- 92
Versatile Anodizing Rack	7- 63
Hard Chromium Plating of Needles — Racking Problems (A)	8- 74

## RECOVERY AND PURIFICATION METHODS

Removal of Silver from Gold Bath (S)	1- 86
Softening Water (S)	1- 86
Carbonate Remover (R)	7- 76
Activated Carbon (M)	10-110
Recovery of Silver from Strips (S)	12- 69

## RECTIFIERS—See Power Supplies

## RINSING—DRAGOUT

Rinsing Techniques	1- 76
Rinsing (L)	1-116
Rinse Tank Control	9- 66

## RUBBER

Rubber Coated Parts Chart (M)	11-132
-------------------------------	--------

## SAFETY PROCEDURES AND EQUIPMENT

Acid-Resistant Workclothes (R)	2- 88
Safety Goggles (R)	2- 93
Acid-resistant Workclothes (M)	5- 92
Safety Equipment (M)	5- 93
Sweatbands (R)	6-137
Solid Plastic Tank Guards (R)	6-140
Chromic Acid Spray Control (R)	7- 75
Handling Caustic Soda Safely (M)	7-100
Industrial Apparel of Acid Resistant Orlon (R)	9-103
Neoprene Gloves (R)	9-106
Technical Chart (M)	10-107
Eye Shield (R)	11- 97
Industrial Skin Cream (R)	12- 80
Palm-Coated Jersey Gloves (R)	12- 85

## SILVER PLATING

High Speed Silver Plating (S)	2- 73
Treatment of Silver to Inhibit Tarnishing (P)	2- 80
Silver Plating Specifications (S)	5- 70
Quicking Process (S)	8- 65
Hydrometer for Silver Solution Control (S)	9- 89
Silver Plating Aluminum Bus Bars	10- 44
Silver Plating Brass (S)	11- 82
Acid Silver Baths (S)	11- 83
Recovery of Silver from Strips (S)	12- 69
Preventing Silver Tarnish (S)	12- 72
Silver Coating (P)	12- 73

## SPOTTING OUT

Spotting-Out and Staining on Plated Work	5- 54
Spotty Plating	10- 61

## STAINLESS STEEL

Continuous Pickling Stainless Steel	3- 68
Stainless Steel Cleaner and Passivator (R)	5- 87
Electropolishing of Stainless Steel Table Knife Blades with Phosphoric-Sulfuric Acid Mixture (A)	5- 97
Electropolishing (P)	6-111
Bright Dip for Stainless Steel (P)	6-112
Electrolytic Polishing Method (P)	6-117
Buffing Compound for Stainless Cutlery (R)	6-126
Stainless Steel Baskets (R)	6-126

## STANDARDS AND SPECIFICATIONS

Copper Alloy Specifications (M)	2-126
Silver Plating Specifications (S)	5- 70
1954 Supplements to Book of ASTM Standards (B)	6-177

## STOP-OFFS

Pressure-Sensitive Tape (R)	3- 97
Masking for Heavy Copper Plate (S)	4- 65

Pressure-Sensitive Tapes (M)	4- 95
Precut Masking Tape (M)	4- 96
Masks and Rack Coats (R)	5- 82
Protective Caps and Plugs (R)	5- 87
Industrial Masking Tape (R)	10- 79

## STRIPPING

Stripping Deposits from Iron (P)	2- 75
Stripping of Electroplate and Lacquer (A)	2- 82
Alkaline Powder for Rust, Scale, Paint Removal (R)	2-101
Metal Strippers (M)	2-126
Stripping Hard Chromium (S)	5- 71
Manufacture of Metal Articles by Electrodeposition (P)	5- 72
Cleaner-Stripper Compound (R)	7- 78
Alkaline Stripper for Rust, Paint, Phosphate Coatings (M)	7- 98
Stripper for Anodized Aluminum (R)	9- 99
Stripping Gold from Silver (S)	10- 65
Stripper for Zinc Chromate Primers on Aluminum (R)	10- 82
Finishing Pointers — Stripping of Tin from Copper-Base Alloys	11- 66
Stripping Deposits from Zinc (P)	11- 87

## TANKS AND LININGS

Neoprene Sheet Lining (R)	2- 93
Polyethylene Fabrications (M)	2-126
Rubber Linings (M)	2-127
Continuous Pickling Stainless Steel	3- 68
Quality Control for Welded Polyethylene (M)	3-125
Rubber Lining Tanks, Valves, Fittings (M)	3-125
Corrosion-Resistant Lining Compound (R)	4- 74
Plastic Lining (R)	4- 78
Portable Tanks (R)	4- 83
Multi-Compartment Tank (R)	5- 81
Laminated Wood Tanks (R)	5- 90
Reinforced Plastic Tanks (R)	8- 88
Acid Brick and Cement (R)	8- 88
Plastic Fabrications (M)	8- 98
Koroseal Tank Lining (M)	8-100
Lining for Nitric-Hydrofluoric Dip (S)	9- 90
Method of Lining a Tank (P)	9- 94
Plastic Tanks (R)	9-103
Plastic Equipment (M)	10-108
Polyvinyl Chloride Fabrications (M)	10-109
Sprayed Metal Coatings (M)	10-110
Bond for Re-Concreting (R)	11- 94
Rubber Coated Parts Chart (M)	11-132
Engineered Chemical Equipment (M)	11-133
Permanent Floor Patch (R)	12- 91
Acid Resisting Floor Sealer (R)	12- 93
Corrosion Resistant Equipment (M)	12- 95
Plastics for Corrosion-Resistant Applications (B)	12- 98

## TESTING—ANALYSIS

Determination of Zinc and Tin Coatings on Steel with Hydrochloric Acid Containing Trivalent Antimony Chloride (A)	1- 90
Corrosion Test Cabinet (R)	1- 96
Degreaser Cleanout Indicator (R)	1- 97
Bright Zinc Process (R)	1- 99
Alkali Metals in Phosphating and Cyanide Plating Baths	2- 58
Test Equipment for Anodized Coatings (A)	2- 82
Spectrographic Determination of Nickel and Cobalt Contents in Bright Nickel Baths (A)	2- 82
X-Ray Examination of Electrodeposited Bright Nickel (A)	2- 82
Surface Tension Tester (R)	2- 95
Hardness Tester (R)	2- 98
Sulfate Test Set (R)	3- 90
Salt Spray Corrosion of Cadmium	4- 48
Salt Spray Testing (S)	4- 66
Pencil Test for "Free" Cyanide (R)	4- 83
Standardization of Chromium Bath Tests on a Bent Cathode in the Hull Cell	5- 50
Complex Ions in Chromium Plating Solutions	5- 56
Determination of Oil in a Vapor Degreaser	5- 66
Testing Porosity of Lead Deposits (S)	5- 70
pH Papers (R)	5- 82
Small-Scale Inorganic Qualitative Analysis (B)	5- 97
Rapid Detection of Cations (B)	5- 97
Tests of Electrolytic Tinplates for Canned Foods (A)	5- 97
Standardization of Chromium Bath Tests on a Bent Cathode in the Hull Cell	6- 99
Chromium Thickness Testing (S)	6-107
Analysis of Hypophosphite (P)	6-109
Coating Thickness Tester (R)	6-124
1954 Supplements to Book of ASTM Standards (B)	6-177
The Slot Cell	7- 53
Testing Pickling Baths (P)	7- 69
Factory Packaged pH System (R)	7- 76
Cyanide Tester (M)	7-100
Zinc Determination in Nickel Solution (S)	8- 66
Non-Destructive Thickness Tester (R)	8- 77



Trouble Shooting Charts for Electroplaters (R)	8-80
Adapter for pH Meters (R)	8-84
Portable Brinell Hardness Tester (R)	8-85
Humidity Cabinet (R)	8-87
Surface Tension Testing (M)	8-97
Preece Test for Zinc (S)	9-89
Hydrometer for Silver Solution Control (S)	9-89
Coating Thickness Tester (P)	9-94
Anodized Aluminum Tester (R)	9-114
Glossmeter (R)	9-114
Glass Electrodes for pH (R)	10-82
Industrial pH Guide (M)	10-109
Pointers in Analysis of Copper and Nickel Plating Baths (A)	11-87
Surface Roughness Comparator (R)	11-94
Humidity Test Cabinet (R)	11-96
Battery-Operated pH Meter (M)	11-133
Quality Tests for Black Oxide Coatings on Steel	12-48

## THEORETICAL

Science for Electroplaters — I	3-78
Science for Electroplaters — II	4-62
Science for Electroplaters — III	5-67
Electrolytic Separation Forms of Metals in Theory and Practice	5-78
Science for Electroplaters — IV	6-103
Significance of "Secondary" Inhibition for the Electroplating of Nickel (A)	7-72
Science for Electroplaters — VIII	11-78
Chemical Engineering (B)	11-103

## THROWING POWER

Standardization of Chromium Bath Tests on a Bent Cathode in the Hull Cell	6-99
---	------

## TIN PLATING

Determination of Zinc and Tin Coatings on Steel with Hydrochloric Acid Containing Trivalent Antimony Chloride (A)	1-90
Chemical Protective Treatment for Tinplate Sheet (A)	1-90
Comparison Between Hot Dip Tin and Electroplated Tin Sheets (A)	1-91
The Protective Tin Process (A)	1-91
Tin Fluoborate Plating	4-59
Method of Forming an Oxide Coating on Tin (P)	4-67
Tin Coatings on Ferrous and Non-Ferrous Metals (A)	5-76
Electroplated Tin Coatings (A)	5-79
Tests of Electrolytic Tinplates for Canned Foods (A)	5-97
Flowing Tin Plate (S)	7-67

## TUMBLING AND BARREL FINISHING

Barrel Finishing (P)	2-77
Barrel Finishing Compound (R)	2-86
Removable Covers for Rack Tumbling (R)	2-90
Barrel Finishing Techniques (M)	2-126
Barrel Finishing (M)	2-127
Method of Deburring and Finishing (P)	3-84
Barrel Finishing (M)	3-124
Tumbling Abrasive (M)	4-94
Tumbling Barrel (R)	5-87
Tumbling Barrels (R)	5-91
Tumbling Barrel (R)	6-127
Tumbling Barrel (R)	6-135
Barrel Finishing Media (R)	7-74
Tumbling Barrel (R)	7-76
Mechanical Finishing Machine (R)	7-82
Burnishing Machine (P)	8-70
Barrel Finishing Equipment (R)	8-78
Tilting Tumbling Machines (R)	8-82
Dry Process Tumbling Barrels (M)	8-99
Apparatus for Descaling and Coating Wire (P)	9-95
Barrel Deburring Compound (R)	9-102
Tumbler Handles 3 Vari-Sized Loads at Once (R)	9-105
Barrel Finishing Separator (R)	9-109
Barrel De-Burring Processes (A)	10-75
8-Door Tumbling Barrel (R)	10-76
Heavy-Duty Tumbling Barrel (R)	10-80
New "Mini-Tumbler" (R)	10-89
Bright Finish Without Polishing (S)	11-83
Barrel Deburring Compound (R)	11-90
All-Purpose Tumbling Chips (R)	11-90
Deburring Machine (R)	11-93
Barrel Finishing Compounds and Media (R)	11-93
Wet Process Tumbling Barrels (M)	11-133
Compounds for Barrel Finishing Zinc (R)	12-82
Chip Bins (R)	12-85
Barrel Finishing Compounds (M)	12-94
Burnishing Machines (M)	12-96

## VACUUM DEPOSITION OF METALS

Vacuum Metallizing (P)	4-70
Heater for Vacuum Metallizing Apparatus (P)	6-116
Lacquers for Vacuum Metallizing (M)	6-159
Pumps for Vacuum Metallizing (R)	8-77

Vacuum Metallizing (P)	9-94
Continuous Roll Vacuum Metallizer (R)	9-101
High Vacuum Pumps (M)	9-136
High Vacuum Pumps (M)	12-94

## VENTILATING AND EXHAUST SYSTEMS

Dust Collector (R)	1-100
Wet-Type Dust and Fume Collectors (R)	2-96
Blower Catalog (M)	3-124
Dust and Fume Control (M)	3-124
Cast Iron Industrial Fans (R)	4-82
Ventilating and Exhaust Systems (M)	4-96
Exhaust Stack Cap (R)	5-91
Dust Filter (P)	6-116
Cyclone Dust Collector (M)	7-99
Centrifugal Wet Dust Collector (M)	8-98
Scrubbers for Corrosive Fumes (R)	9-111
Dust Collector (R)	9-112
Exhaust-Blower (R)	9-113
Roof Ventilators (M)	9-135
Propeller Fans (M)	9-136
Solid Plastic Fans for Corrosive Fumes (R)	10-78
Ventilating Fans (M)	10-110
Dust Collector (R)	11-101
Fume Removal System (R)	12-86
Fume Scrubber (R)	12-89
After-Filter for Dust Collector (R)	12-92
Axial Airfoil Fans (M)	12-96
Dust and Vapor Collectors (M)	12-97

## WASTES, TREATMENT AND DISPOSAL OF

Plating Wastes—A Review of Research Design and Construction of Acid-Proof Trenches (M)	1-67
Waste Water Reclamation for Industrial Purposes (M)	3-123
Waste Treatment (M)	4-94
Drain Troughs (M)	5-92
Recirculation of Waste Pickle Liquor (P)	5-94
Acid Neutralization (S)	6-109
Method of Pickling Iron and Recovering Pickling Agent (P)	8-65
Waste Treatment of Cyanides and Chromic Acid (M)	8-69
Controls for Waste Treatment (M)	9-138
Principles of Industrial Waste Treatment (B)	10-108
Waste Disposal (M)	11-103
Clarifiers and Thickeners (M)	11-132
Waste and Waste Chlorinator (M)	12-94
	12-95

## WATER

Rinsing Techniques	1-76
Softening Water (S)	1-86
Ion Exchanger Control (R)	1-102
Ion-Exchange Applications (M)	1-104
Rinsing (L)	1-116
Portable Mixed-Bed Demineralizer (R)	2-89
Permanent Cartridge Demineralizer (R)	2-100
Do's and Don'ts in Plating Operations	4-40
Steam and Water Mixer (R)	4-79
Dual-Type Demineralizer (R)	4-80
Hard Water Bypass for Zeolite Softeners (R)	4-83
Waste Water Reclamation for Industrial Purposes (M)	4-94
Distilled Water Bottle Pump (R)	5-83
Zeolite Water Softeners (M)	5-93
Hot Zeolite Water Conditioner (R)	6-127
Small Zeolite Water Softeners (R)	6-143
Feedwater Heater (R)	7-75
Demineralizer (R)	7-78
Water Filters (M)	7-99
Automatic Mixed Bed Demineralizers (M)	8-97
Controls for Zeolite Softeners (R)	9-105
Mixed-Bed Demineralizer (R)	9-105
Research Model Demineralizer (R)	9-108
Design of Water Clarifiers and Softeners (M)	9-137
Packaged Water Softeners (R)	12-83
New Device for Effective Backwashing (R)	12-97
Control Panel for Water Treatment (M)	12-95
Process Equipment (M)	12-97

## WETTING AGENTS

Addition Agent for Chromium Bath Throwing Power (R)	10-84
---	-------

## ZINC PLATING

Bright Cyanide Zinc Bath (P)	1-87
Determination of Zinc and Tin Coatings on Steel with Hydrochloric Acid Containing Trivalent Antimony Chloride (A)	1-90
The Bend Properties of Zinc Coatings (A)	1-90
Bright Zinc Process (R)	1-96
Electropolishing Zinc (P)	2-80
Pressure in Plating Barrels (S)	6-106
Plating Zinc on Die Castings (S)	8-65
Preece Test for Zinc (S)	9-89
Addition Agents for Zinc Plating (R)	10-76
Continuous Hot Galvanizing of Strip	11-67
Hot Galvanizing (P)	12-74
Zinc Bright Dip (R)	12-80

## INDEX TO AUTHORS

Brooks, Eugene—Getting the Most Out of Centrifugal Pumps	10-57
Bueltman, Charles—Do's and Don'ts in Plating Operations	4-40
Carroll, J. W.—Inhibited Acids in Plating Cycles	3-60
Cook, Nelson E.—Continuous Hot Galvanizing of Strip	11-67
Crowley, Charles E.—The Use of Filters in Electroplating	2-52
Doss, Jodie—Phosphate Coating Retention During Cold Extrusion of Artillery Shells	4-56
Quality Tests for Black Oxide Coatings on Steel	12-48
Eisler, Stanley L.—Phosphate Coating Retention During Cold Extrusion of Artillery Shells	4-56
Foulke, Dr. D. Gardner—Plating Wastes—A Review of Research	1-67
Gabrielson, Gunnar—Alkali Metals in Phosphating and Cyanide Plating Baths	2-58
Complex Ions in Chromium Plating Solutions	5-56
Gilbert, Lloyd O.—Phosphate Coating Retention During Cold Extrusion of Artillery Shells	4-56
Hall, Nathaniel—Technical Developments of 1954	1-58
Great Flexibility a Feature of New Automatic Plater	8-45
Herr, Fred A.—Oil Derrick Marks Chromium Tank	7-59
Hogaboom, G. B. Jr.—Spotting-Out and Staining on Plated Work	5-54
Jaray, Dr. Francis F.—Continuous Pickling Stainless Steel	3-68
Keating, John—Methods of Coating Plastics with Metal	9-76
Kushner, Joseph B.—Rinsing Techniques—Plating Bath Control: Past, Present and Future	1-76
	5-59
Ledford, Raymond F.—Plating Wastes—A Review of Research	1-67
Lorking, K. F.—Electropolishing "Nimonic 80"	5-64
Lowenheim, Dr. Frederick A.—Bronze Plating: Why and How	7-51
McHenry, Dennis—Phosphate Coating Retention During Cold Extrusion of Artillery Shells	4-56
McNeill, Wm.—Anodizing Hollow Objects The Cr-22 Coating for Magnesium	2-61
	12-57
Mohler, J. B.—The Use of Filters in Electroplating	2-52
Electropolishing for Shelf Life	3-64
Tin Fluoborate Plating	4-59
Determination of Oil in a Vapor Degreaser	5-66
The Slot Cell	7-53
Rinse Tank Control	9-66
Copper-Tin-Zinc Plating	10-47
Spotty Plating	10-61
Stripping of Tin from Copper-Base Alloys	11-66
Electropolishing on Porous Metal	11-70
Filters—Construction and Operation	12-51
Plating Within Limits	12-65
Morris, Melville—Metal Cleaning with Ultrasonics	2-63
Pearlstein, Fred—Electroless Nickel Deposition	8-59
Pinner, R.—Surface Treatment and Finishing of Light Metals	2-66, 3-73, 6-91, 9-69, 10-52, 11-74
Pocock, Walter E.—A Survey of Chromate Treatments	1-80
Read, Dr. Harold J.—The Structure of Electrodeposited Metals	11-60, 12-60
Ricks, H. E.—Silver Plating Aluminum Bus Bars	10-44
Rousselot, Robert H.—Standardization of Chromium Bath Tests on a Bent Cathode in the Hull Cell	5-50, 6-99
Serota, L.—Science for Electroplaters	3-78, 4-62, 5-67, 6-103, 7-64, 8-62, 9-86, 10-62, 11-78, 12-66
Starr, John—Descaling and Pickling Titanium	2-65
Strobach, William—Electrodeposition of Nickel from Fluoborate Solutions	7-44, 8-53, 9-79
Toth, Julius—Silver Plating Aluminum Bus Bars	10-44
Weil, Rolf—The Structure of Electrodeposited Metals	11-60, 12-60
Wernick, Dr. S.—Surface Treatment and Finishing of Light Metals	2-66, 3-73, 6-91, 9-69, 10-52, 11-74
West, Harry J.—Electroless Chromium	7-62
Wolf, Russell H.—Salt Spray Corrosion of Cadmium	4-48
Young, Dr. C. B. F.—Electrodeposition of Nickel from Fluoborate Solutions	7-44, 8-53, 9-79



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## PATENTS

(Continued from page 75)

### Abrasive Strip Wheel

U. S. Patent 2,709,323. May 31, 1955.  
R. J. Swan, assignor to Engis, Ltd.

A rotary abrasive tool, comprising a main end plate adapted to be detachably mounted on a driving shaft, a plurality of closely spaced outwardly extending brushes carried by and distributed around the periphery of said main end plate, a plurality of abrasive strips wound upon each other within said tool with the free end of at least one of them extending outwardly between adjacent brushes, a support mounted in said body for relative rotation about the rotary axis thereof, an annular series of anchorages carried by said support, said anchorages serving individually for anchoring the inner ends of at least one of said abrasive strips and together forming coaxially with the main end plate, a spool on which said abrasive strips are windable upon each other, a detachable end plate located opposite to and coaxially with said main end plate and cooperating therewith in fixedly supporting said brushes and rotatably carrying said support, rotation transferring means mounted on said detachable end plate and drivably connected with said support, actuating means drivably connected to the input side of said rotation transferring means, said actuating means being externally operable to cause said rotation transferring means to drive and cease driving said support, a casing enclosing said rotation transferring means, and a tubular member screw-threaded at one end for engagement with the main end plate and having a flange at the other end adapted to bear against the outer end surface of said casing.

### Anti-Tarnish Wrappers

U. S. Patent 2,709,653. May 31, 1955.  
H. B. Marshall and W. R. Bennett, assignors to The Dominion Cellulose Limited

A process for imparting antitarnish properties to fibrous materials which comprises precipitating only finely divided basic copper carbonate on the fibers of the material.

## EQUIPMENT and SUPPLIES ADVERTISED in this Issue

A handy reference list of specific items, the number refers to the page of a manufacturer's advertisement. When writing to these firms, we would appreciate your mentioning our publication.

A	
Aluminum Oxide Abrasives	41, 108
Anode Bags	16
Anode Baskets	96
Anodes	18D, 46
Anodes, Cadmium	16
Anodes, Copper	16, 31, 39, 117
Anodes, Lead	16
Anodes, Lead Alloy	16
Anodes, Nickel	16, 103, 117
Anodes, Silver	26
Anodes, Tin	16
Anodes, Zinc	16
Automatic Loading Device	18C
Automatic Polishing Machine	6, 115

B	
Backstand Idlers	5, 34
Barrel Finishing Equipment	5, 12, 13, 28, 97, 108
Blackening Compounds	46
Blowers	29
Booth Cleaning Compound	16
Boric Acid	111
Brass Solutions	40, 90B
Bright Copper Process	90B, 93, 98
Bright Gold Process	90B
Bright Silver Process	18C, 37, 77, 90B, 107, 109, 111, 114
Brighteners	107
Brush Plating Process	5, 38, 95, 103, 110, 113, 117
Bufs	113
Bufs, Goblet	38, 42, 95
Bufs, Sisal	

C	
Cadmium Fluoborate	16
Cadmium Oxide	16
Cadmium Plating Processes	88, 90B
Chemicals	11, 16, 37, 108
Chromic Acid	11, 16, 92
Chromium Plating Process	14
Cleaners	45, 81, 93, 112, 115, Back Cover
Compositions	5, 17, 74, 86, 90A, 95, 103
Compositions, Liquid	109, 115, 117
Conversion Coatings	20, 90A, 100, 109, 111
Copper Cyanide	3, 83, 110
Copper Fluoborate	16
Copper Plating Process	106
Copper Sulphate	16

D	
Degreasers	7, 84
Degreasers, Ultrasonic	84
Degreasing Solvents	3, 7, 84
Diaphragms	10

E	
Electroless Nickel Process	99
Emery	116

F	
Felt Polishing Wheels	32
Filters	18A, 82, 87, 90, 103, 105, 106

G	
Generators	44, 101, 115
Glue	100
Gold Plating Process	93, 98

H	
Heat Exchangers	90, 96

I	
Immersion Heaters, Quartz	32
Immersion Heaters, Stainless	32, 46
Ion Exchange Equipment	18, 38, 79, 90

L	
Lapping Paste	90A
Lead Fluoborate	16
Liquid Compositions	20, 90A, 100, 109, 111

M	
Materials of Construction	8, 18A, 43, 68, 70, 71, 96

N	
Nickel Plating Process	16, 90B
Nickel Salts	16, 103

P	
Periodic Reverse Units	110
pH Papers	116
Pickling Equipment	44, 103
Pipes	43, 68
Plastic Lining Materials	43, 68
Plating Barrels	15, 33, 44, 103, 105
Plating Barrels, Portable	33
Plating Equipment	18A, 44, 46, 101, 108, 115, 117
Plating Equipment, Automatic	18A, 44, 89
Plating Rack Assemblies	90A, 100, 111
Polishing Cement	5
Polishing Lathes	11
Potassium Bichromate	24
Potassium Cyanide	3
Process for Plating on Aluminum	78, 90
Pumps	

R	
Rack Coating Materials	8, 36, 85, 94, 108
Rack Patching Material	36
Recasting Nickel Anodes	18C
Rectifiers	9, 18C, 22, 23, 44, 46, 100, 101
	104, 115, Inside Back Cover
Rhodium Plating Solution	40, 93, 98
Rochelle Salts	16
Rubber Lined Tanks	10, 90, 96, 101, 103
Rust Proofing Compounds	3
Rust Removers	3, 4

S	
Scratch Brushes	115
Semi-Automatic Polishing Machines	6, 75
Sherardizing Equipment	116
Silicone Carbide Abrasives	41, 108
Silver Cyanide	16
Silver Plating Process	90B, 93
Sodium Bichromate	11
Sodium Cyanide	16
Sodium Orthosilicate	27
Sodium Stannate	16
Solvent Recovery Stills	84
Spray Buffing Equipment	100, 111
Spray Depressant	37, 90A
Stannous Sulphate	16
Strippers, Enamel	3, 4
Strippers, Metal	3
Surface Finishing Machine	102

T	
Tanks	18A, 46, 101
Tanks, Plastic	68
Temperature Regulators	46, 91
Testing Equipment	37, 102, 104
Thickness Tester	104
Tin Addition Agent	16
Tin Fluoborate	16
Tumbling Abrasives	19, 41, 108
Tumbling Barrels	5, 12, 13, 28, 97, 108

V	
Vacuum Coating Equipment	21, 30
Ventilating Systems	96

W	
Waste Treatment	18, 18A, 38, 79, 90
Wetting Agents	37, 90B
Wire Brushes	115

Z	
Zinc Fluoborate	16
Zinc Sulphate	16

# SUPPLIERS OF EQUIPMENT AND MATERIALS AND ADVERTISERS INDEX

<b>Acme Manufacturing Co.</b> 1400 E. 9 Mile Rd., Detroit 20 (Ferndale), Mich.	6	<b>General Electric Co.</b> Schenectady 5, N. Y.	22, 23	<b>New Holland Machine Co.</b> New Holland, Pa.	
<b>Alert Supply Co.</b> 4755 E. 49th St., Los Angeles 58, Calif.	115	<b>Glo-Quartz Electric Heater Co., Inc.</b> 37934 Elm St., Willoughby, Ohio		<b>Niagara Alkali Co.</b> 60 E. 42nd St., New York 17, N. Y.	
<b>Allied Research Products, Inc.</b> 4004 E. Monument St., Baltimore 5, Md.	83	<b>Graber Water Conditioning Co.</b> 216 W. 14th St., New York 11, N. Y.	18	<b>Nobles Engineering &amp; Mfg. Co.</b> 647 East 7th St., St. Paul, Minn.	
<b>Almco Div., Queen Stove Wks.</b> Albert Lea, Minn.	12, 13	<b>Guaranteed Buff Co., Inc.</b> 20 Vandam St., New York 13, N. Y.	110	<b>Northwest Chemical Co.</b> 9310 Roselawn Ave., Detroit 4, Mich.	
<b>Alsop Engineering Corp.</b> 1012 Bright St., Milldale, Conn.	87	<b>Gumm Chemical Co., Inc., Frederick</b> Inside Front Cover		<b>Norton Co.</b> 1 New Bond St., Worcester 6, Mass.	19
<b>American Brass Co.</b> Waterbury 20, Conn.	39	<b>H &amp; S Equipment &amp; Sales Co.</b> 483 Keap St., Brooklyn 11, N. Y.	124	<b>Oakite Products, Inc.</b> 18 Rector St., New York 6, N. Y.	4
<b>American Buff Co.</b> 2414 S. LaSalle St., Chicago 16, Ill.		<b>Hamilton Emery &amp; Corundum Co.</b> Chester, Mass.	116	<b>Packer Machine Co.</b> Center St., Meriden, Conn.	
<b>American Chemical Paint Co.</b> Ambler, Pa.		<b>Hammond Machinery Builders, Inc.</b> 1601 Douglas Ave., Kalamazoo 54, Mich.	75	<b>Pennsylvania Salt Mfg. Co.</b> 3 Penn Center Plaza, Philadelphia 2, Pa.	45, 81
<b>American Instrument Co., Inc.</b> Silver Spring, Md.		<b>Handy &amp; Harman</b> 82 Fulton St., New York 38, N. Y.		<b>Perma-Line Rubber Products Corp.</b> 1755 N. Winnebago Ave., Chicago 47, Ill.	96
<b>American Metal Co., Ltd., The</b> 61 Broadway, New York, N. Y.	31	<b>Hanson-Van Winkle-Munning Co.</b> Matawan, N. J.	20, 70, 71	<b>Pesco Plating Equipment Corp.</b> 75 Wythe Ave., Brooklyn 11, N. Y.	125
<b>American Platinum Works</b> 231 New Jersey R. R. Ave., Newark 5, N. J.	26	<b>Harrison &amp; Co., Inc.</b> 487 Groveland St., Haverhill, Mass.	109	<b>Platers Research Corp.</b> 59 E. 4th St., New York 3, N. Y.	109
<b>A &amp; P Finishing &amp; Mfg. Co.</b> 17760 Clarann Ave., Melvindale (Detroit), Mich.		<b>Harshaw Chemical Co., The</b> 1945 E. 97th St., Cleveland 6, Ohio	16	<b>Powers Regulator Co., The</b> 3400 Oakton St., Skokie, Ill.	91
<b>Apothecaries Hall Co.</b> 22 Benedict St., Waterbury 20, Conn.	74	<b>Hartwell &amp; Son, Inc., H. N.</b> 947 Park Sq. Bldg., Boston 16, Mass.		<b>Promat Div., Poor &amp; Co.</b> 851 S. Market St., Waukegan, Ill.	
<b>Atlantic Compound Co.</b> 1860 Baldwin St., Waterbury, Conn.	115	<b>Haveg Corp.</b> Newark 5, Del.		<b>Rampe Manufacturing Co.</b> 14915 Woodworth Ave., Cleveland 10, Ohio	
<b>Automatic Buffing Machine Co.</b> 222 Chicago St., Buffalo 4, N. Y.	10	<b>Henderson Bros. Co.</b> 133 S. Leonard St., Waterbury, Conn.	28	<b>Ransohoff, Inc.</b> 630 N. Fifth St., Hamilton, Ohio	9
<b>Automotive Rubber Co.</b> 12572 Beech Rd., Detroit 28, Mich.	32	<b>Hill Acme Co.</b> 1209 W. 65th St., Cleveland 2, Ohio		<b>Rapid Electric Co.</b> 2891 Middletown Road, Bronx 61, N. Y.	
<b>Bacon Felt Co.</b> 437 W. Water St., Taunton, Mass.		<b>Holland &amp; Sons, Inc., J.</b> 475 Keap St., Brooklyn 11, N. Y.	101	<b>Raybestos-Manhattan, Inc.,</b> Manhattan Rubber Div.	
<b>Baird Machine Co.</b> Stratford 9, Conn.	124	<b>Hull &amp; Co., R. O.</b> 1303 Parsons Ct., Rocky River 16, Ohio	37	<b>Rhodes &amp; Co., James H.</b> 157 W. Hubbard St., Chicago 10, Ill.	
<b>Baker Co., The M. E.</b> 113 Astor St., Newark 5, N. J.		<b>Hussey &amp; Co., C. G.</b> 2860 Second Ave., Pittsburgh 19, Pa.		<b>Richardson Allen Corp.</b> 39-15 Main St., Flushing, N. Y.	
<b>Baker Co., The M. E.</b> 25 Wheeler St., Cambridge, Mass.	113	<b>Illinois Water Treatment Co.</b> 836 Cedar St., Rockford, Ill.	38	<b>Roto Finish Co.</b> 3706 Millham Rd., Kalamazoo, Mich.	43
<b>Barker Bros., Inc.</b> 1660 Summerfield St., Brooklyn 27, N. Y.		<b>Industrial Filter &amp; Pump Mfg. Co.</b> 5906 Ogden Ave., Chicago 50, Ill.	90	<b>Saran Lined Pipe Co.</b> 2415 Burdette Ave., Ferndale 20, Mich.	
<b>Bart-Messing Corp.</b> 229 Main St., Belleville 9, N. J.	103	<b>Inflico, Inc.</b> 912 S. Campbell Ave., Tucson, Ariz.	34	<b>Sarco Co., Inc.</b> 350 Fifth Ave., New York 1, N. Y.	17
<b>Beam Knodel Co.</b> 195 Lafayette St., New York 12, N. Y.	25, 105	<b>International Chemical Co., Inc.</b> 2628 N. Moscher St., Philadelphia 33, Pa.	103	<b>Schoffner Mfg. Co.</b> Schoffner Center, Emsworth, Pittsburgh 2, Pa.	
<b>Belke Manufacturing Co.</b> 947 N. Cicero Ave., Chicago 51, Ill.		<b>International Nickel Company, Inc.</b> 67 Wall St., New York 5, N. Y.		<b>Schori Process Div., Ferro Corp.</b> 8-11 43rd Rd., Long Island City 1, N. Y.	93
<b>Belmont Smelting &amp; Refining Work, Inc.</b> 304 Belmont Ave., Brooklyn 7, N. Y.	92	<b>International Rectifier Corp.</b> 1521 E. Grand Ave., El Segundo, Calif.	110	<b>Sel Rex Precious Metals, Inc.</b> 229 Main St., Belleville 9, N. J.	105
<b>Better Finishes &amp; Coatings, Inc.</b> 268 Doremus Ave., Newark 5, N. J.	7	<b>International Rustproof Corp.</b> 12507 Plover Ave., Cleveland 7, Ohio	106	<b>Sethco Mfg. Co.</b> 74 Willoughby St., Brooklyn, N. Y.	100
<b>Blakeslee &amp; Co., G. S.</b> Chicago 50, Ill.		<b>Jelco Finishing Equipment Corp.</b> 153 E. 26th St., New York 10, N. Y.	38	<b>Siefen Co., J.</b> 5643 Linderdale, Detroit 9, Mich.	
<b>Block &amp; Co., Wesley</b> 39-15 Main St., Flushing, N. Y.	125	<b>Joe-D Buff Co.</b> Sandwich, Ill.		<b>Simonds Abrasive Co.</b> Philadelphia 37, Penna.	40
<b>Brucar Equipment &amp; Supply Co.</b> Box 433, Hempstead, L. I., N. Y.	86	<b>Kaykor Industries</b> 4400 Broad St., Yardville, N. J.	99	<b>Smoothex, Inc.</b> 10705 Briggs Rd., Cleveland 11, Ohio	117
<b>Buckeye Products Co.</b> 7033 Vine St., Cincinnati 16, Ohio	97	<b>Keystone Chromium Corp.</b> 1095 Niagara St., Buffalo, N. Y.	102	<b>Sommers Bros. Mfg. Co.</b> 3439 No. Broadway, St. Louis 7, Mo.	82
<b>Buckingham Products Co.</b> 14100 Fullerton Ave., Detroit 27, Mich.	97	<b>Kocour Company</b> 4801 S. St. Louis Ave., Chicago 32, Ill.	114	<b>Sparkler Mfg. Co.</b> Mundelein, Ill.	108
<b>California Rack Co.</b> 4982 Firestone Blvd., South Gate, Calif.	36	<b>Kosmos Electro-Finishing Research</b> 13 Valley St., Belleville 9, N. J.	116	<b>Speed-D-Burr Corp.</b> 3613-A San Fernan to Rd., Glendale 4, Calif.	36
<b>Casalbi Company</b> West Ganson & Wayne, Jackson, Mich.	68	<b>Kushner, Joseph B.</b> Stroudsburg, Pa.	125	<b>Standard Plating Rack Co.</b> 1925 N. Paulina St., Chicago 22, Ill.	94
<b>Chandeysson Electric Co.</b> 4074 Bingham Ave., St. Louis 16, Mo.	42	<b>Land, Inc., L. J.</b> 146-148 Grand St., New York 13, N. Y.		<b>Stanley Chemical Co.</b> 81 Berlin St., E. Berlin, Conn.	
<b>Chemical Corp., The</b> 54 Waltham Ave., Springfield, Mass.	84	<b>Lasolco, Inc.</b> 2818-38 LaSalle St., St. Louis 4, Mo.	90A	<b>Stauffer Chemical Co.</b> 380 Madison Ave., New York 17, N. Y.	106
<b>Churchill Co., Inc., Geo. R.</b> Hingham, Mass.	102	<b>Lea Mfg. Co.</b> 16 Cherry Ave., Waterbury 86, Conn.	111	<b>Steadfast Industries, Inc.</b> 4731 W. Madison St., Chicago 44, Ill.	35
<b>Circo Equipment Co.</b> 130 Central Ave., Clark Twp. (Rahway), N. J.	32	<b>Lea-Michigan, Inc.</b> 14066 Stansbury Ave., Detroit 27, Mich.	90B	<b>Stevens, Inc., Frederic B.</b> Detroit 16, Mich.	30
<b>Clair Manufacturing Co.</b> Olean, N. Y.	41, 124	<b>Lea-Ronal, Inc.</b> 139-20 109th Ave., Jamaica 35, N. Y.	5	<b>Stokes Machine Co., F. J.</b> 5500 Tabor Rd., Philadelphia 20, Pa.	101
<b>Cleveland Process Co.</b> 1965 East 57th St., Cleveland 3, Ohio		<b>L'Hommedieu &amp; Sons Co., Chas. F.</b> 4521 Ogden Ave., Chicago, Ill.		<b>Storts Welding Co., Inc.</b> 38 Stone St., Meriden, Conn.	33
<b>Clinton Supply Co.</b> 112 S. Clinton St., Chicago 6, Ill.	40	<b>MacDermid, Incorporated</b> Waterbury 20, Conn.		<b>Strutz Mfg. Co., Geo. A.</b> 4430 Carroll Ave., Chicago 24, Ill.	107
<b>Codman Co., F. L. and J. C.</b> 694 Plain St., Rockland, Mass.		<b>Magnus Chemical Co.</b> 11 South Ave., Garwood, N. J.		<b>Sulphur Products Co., Inc.</b> Greensburg 7, Pa.	
<b>Cohn Mfg. Co., Inc., Sigmund</b> 121 S. Columbus Ave., Mt. Vernon, N. Y.	15	<b>Magnuson Products, Inc.</b> 50 Court St., Brooklyn 1, N. Y.	112	<b>Swift Industrial Chemical Co.</b> Canton, Conn.	
<b>Cowles Chemical Co.</b> 7016 Euclid Ave., Cleveland 3, Ohio	107	<b>Manhattan Rubber Div.,</b> Raybestos-Manhattan, Inc.		<b>Tammis Industries, Inc.</b> 228 N. LaSalle St., Chicago 1, Ill.	98
<b>Crown Rheostat &amp; Supply Co.</b> 3465 N. Kimball Ave., Chicago 18, Ill.	108	<b>Mathew Tool Works</b> 2426B N. Clybourn, Chicago 14, Ill.	34	<b>Technic, Inc.</b> 39 Snow St., Providence, R. I.	
<b>Dalic Metachemical, Ltd.</b> 121 Leicester Ave., Toronto 18, Canada	78	<b>McGean Chemical Co.</b> 1040 Midland Bldg., Cleveland 15, Ohio		<b>Ther Electric &amp; Machine Works</b> 19 So. Jefferson St., Chicago 6, Ill.	
<b>Davies Supply &amp; Mfg. Co.</b> 4160 Meramec St., St. Louis 16, Mo.		<b>Metal &amp; Thermit Corp.</b> 100 E. 42nd St., New York 17, N. Y.		<b>Thermex Co., Inc., N. J.</b> 535 Bergen St., Harrison, N. J.	
<b>Davis-K Products Co.</b> 135 W. 29 St., New York, N. Y.		<b>Michigan Buff Co.</b> 3503 Gaylord Ave., Detroit 12, Mich.	126	<b>Thermo-Panel Div., Deen Products, Inc.</b> 1042 Dean St., Brooklyn 38, N. Y.	111
<b>Deming Co., The</b> 567 Broadway, Salem, Ohio		<b>Michigan Chrome &amp; Chemical Co.</b> 8613 Grinnell Ave., Detroit 13, Mich.	8	<b>True-Brite Chemical Products</b> P. O. Box 31, Oakville, Conn.	88, 89
<b>Diamond Alkali Co.</b> 300 Union Commerce Bldg., Cleveland 14, Ohio	115	<b>Minnesota Mining &amp; Mfg. Co.</b> 900 Fauquier Ave., St. Paul 6, Minn.		<b>Udylite Corp., The</b> Detroit 11, Mich.	104, 110
<b>Dixon Rippel, Inc.</b> Kingston, N. Y.	27	<b>Mitchell Bradford Chemical Co.</b> Wampus Lane, Milford, Conn.	124	<b>Unit Process Assemblies, Inc.</b> 75 East 4th St., New York, N. Y.	14, 46
<b>Dow Chemical Company, The</b> Midland, Michigan	24	<b>Motor Repair &amp; Mfg. Co., The</b> 1555 Hamilton Ave., Cleveland 14, Ohio		<b>United Chromium Div.,</b> Metal & Thermit Corp.	
<b>Du-Lite Chemical Corp.</b> Middletown, Conn.	100	<b>Murray-Way Corp.</b> P. O. Box 180, Maple Rd. E., Birmingham, Mich.	11	<b>U. S. Galvanizing &amp; Plating Equipment Corp.</b> 31 Heyward St., Brooklyn, N. Y.	85
<b>Du Pont de Nemours &amp; Co., E. I.</b> Wilmington, Del.	3	<b>Mutual Chemical Div.,</b> Allied Chemical & Dye Corp.	79	<b>U. S. Stoneware Co.</b> Akron 9, Ohio	117
<b>Electronic Rectifiers, Inc.</b> 2102 Spann Ave., Indianapolis 3, Ind.		<b>Naraco Group</b> National Aluminate Corp.	21	<b>Universal Foundry &amp; Machine Co.</b> 14841 Meyers Rd., Detroit 27, Mich.	10A-D, 115
<b>Enthone, Inc.</b> 442 Elm St., New Haven, Conn.		<b>National Research Corp.</b> Charlemont St., Newton Highlands 61, Mass.		<b>Walker Div., Norma-Hoffman Bearings Corp.</b> Stamford, Conn.	104
<b>Exolon Co.</b> 945 E. Niagara, Tonawanda, N. Y.		<b>National Sheradizing &amp; Machine Co., Inc.</b> Hartford, Conn.	116	<b>Wallace &amp; Tiernan Co., Inc.</b> 25 Main St., Belleville 9, N. J.	29
<b>Federated Metals Div., American Smelting &amp; Refining Co.</b> 120 Broadway, New York 5, N. Y.				<b>Wyandotte Chemicals Corp.</b> Wyandotte, Mich.	
<b>Formax Manufacturing Co.</b> 3171 Bellevue, Detroit 7, Mich.				<b>Zialite Corp.</b> 92 Grove St., Worcester 5, Mass.	
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